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A Description Of The Reality Of Dealing With Cardiac Arrest Cases Before Hospitalization In The Saudi Red Crescent

Omar Abdullah Al-Dawas[1] , Ahmed Mofareh Abdullah Al-Qahtani[2] , Faleh Majed Faleh Al-Qahtani[3] , Adel Mutlaq Al-Otaibi[4] , Hani Mutlaq A. Al-Thiyabi[5] , Sufyan Abdulrahman Al-Sloom[6] , Wafi Nashi Al-Otaibi[7] , Abdullah Mohammad Saif Al-Sahli[8]

[1]Emergency Medical Technician (EMT) Saudi Red Crescent Authority – Qassim Region
[2]Emergency Medical Technician (EMT) Saudi Red Crescent Authority – Abha, Asir Region
[3]Emergency Medical Technician (EMT) Saudi Red Crescent Authority – Al-Quwayiyah
[4]Emergency Medical Technician (EMT) Saudi Red Crescent Authority – Al-Quwayiyah
[5]Emergency Medical Technician (EMT) Saudi Red Crescent Authority – Al-Muwaih
[6]Paramedic / Emergency Medical Technician (EMT) Saudi Red Crescent Authority – Buraidah, Qassim Region
[7]Health Assistant Saudi Red Crescent Authority – Al-Muwaih
[8]Emergency Medical Technician (EMT) Saudi Red Crescent Authority – Al-Quwayiyah

Abstract:

This research intends to characterize the fact of the management of the cardiac arrest cases prior to the hospitalization in the Saudi Red Crescent Authority. The research paper will use a descriptive approach, where it will only review and analyze earlier studies, academic research, scientific research, and official reports on pre-hospital emergency medical services and management of cardiac arrest cases. There were no field survey, experimental or direct data collection instruments. The study area of interest is to detail the existing procedures used by Saudi Red Crescent paramedics in responding to the cardiac arrest cases within the pre-hospital environment, emergency response operations, first patient evaluation, cardiopulmonary resuscitation (CPR) and automated external defibrillators (AEDs), as well as communication with the hospitals of receiving. Besides, the paper outlines the key issues and limitations that have been outlined by other literature sources, including response time, equipment availability, the degree of professional training, community knowledge of emergency response, and logistical and environmental considerations that can influence patient outcomes. The research provides a robust representation of the existing reality of the pre-hospital cardiac arrest management at the Saudi Red Crescent through both the analysis and synthesis of the current studies. The conclusions of this descriptive review should help improve the awareness of the strengths and gaps in the existing practice and assist a decision-maker/healthcare planner to increase the efficiency and quality of pre-hospital emergency medical services, which would, in turn, help to improve the survival rates and patient outcomes in cases of cardiac arrest

.**Keywords**: Cardiac Arrest, Pre-Hospital Care, Descriptive Study, Saudi Red Crescent, Emergency Medical Services.

- introduction

Rapid response is a crucial element in dealing with cardiac arrest. The Saudi Red Crescent Authority works to reduce response time by receiving reports through the unified ambulance number997 or through the Is'afni" (Rescue Me) application, where advanced ambulance teams are deployed" Based on clear and up-to-date national medical protocols that include immediate assessment of the patient's condition upon arrival, immediate initiation of high-quality cardiopulmonary resuscitation procedures, and use of an .automated external defibrillator (AED As soon as possible, focusing solely on CPR In certain

circumstances, such as the COVID-19 pandemic, to ensure the safety of paramedics and patients, a ,qualitative development has occurred through the activation of specialized pre-hospital care pathways most notably the cardiac stroke pathway. This pathway aims to bypass traditional emergency departments and transfer patients with acute myocardial infarction directly to the cardiac catheterization lab in specialized hospitals. This is done after performing an electrocardiogram (ECG On-site by the paramedic and sent to on-call consultants for confirmation, which greatly reduces the time required to open the blocked artery, an important factor in reducing complications and increasing the chances of survival 1,9

In addition, the success of dealing with these cases depends on the effective integration between ambulance teams and specialized hospitals, where direct coordination takes place between the Medical Control Department of the Saudi Red Crescent and specialized health centers to ensure that the operating room or catheterization lab is prepared before the patient arrives. This coordination includes activating the hub and branch system in some areas, which ensures that the patient is transferred to the health facility most capable of dealing with his complex case Sometimes, air ambulance is used to reduce the transfer time in critical cases. This development represents a qualitative leap in the quality of pre-hospital emergency care in the Kingdom6,7

- **The concept of cardiac arrest and its importance in pre-hospital services**

Pre-hospital is based on the concept of cardiac arrest and the urgency of intervention. emergency and ambulance services. Cardiac arrest is a sudden and life-threatening emergency that occurs when the heart unexpectedly stops pumping blood effectively to the rest of the body, including the brain and other vital organs. The primary cause is a malfunction in the heart's electrical system, leading to a dangerous arrhythmia such as ventricular fibrillation where the heart quivers instead of beating forcefully. This sudden cessation of blood circulation leads to loss of consciousness, cessation of breathing, abnormal breathing or gasping, and absence of a pulse within seconds. It is crucial to distinguish between cardiac arrest and a heart attack. A heart attack is caused by a blockage in a coronary artery, while cardiac arrest is an electrical problem that may result from a heart attack, but it is not the same thing. Therefore, the critical importance of managing cardiac arrest in pre-hospital services lies in the fact that time is the most critical factor where Brain cells begin to deteriorate within 4-6 minutes of oxygen deprivation, and every minute of delay in starting CPR is a contributing factor Using a defibrillator reduces the patient's chances of survival by up to therefore, the rapid response of ambulance crews, initiation of high-quality CPR, and delivery of ;%10 electric shock are crucial At the scene of the incident, interventions are the only ones that can reverse the course of cardiac arrest and increase the chances of spontaneous return of blood circulation Thus improving the patient's neurological outcomes 7,8

Hence the most valuable step in the chain of survival is the pre-hospital services, which is symbolized by paramedics, in order to save the life of a patient in cardiac arrest. This series starts as soon as the diagnosis of cardiac arrest is made and the assistance is requested, with the next stage being the early cardiopulmonary resuscitation and early defibrillation process. These are the two fundamental interventions that are administered on-site where the paramedic is ready to administer advanced care, including giving intravenous drugs, including epinephrine or adrenaline and advanced airway management, immediately transferred to a hospital to receive follow-up care. Thus it is the efficiency and skill of these services which give the patient his relation to life in his first moments when fate is decided 6,1.

- **The role of emergency services in dealing with cardiac arrest cases: a general perspective**

Emergency medical services, including the Saudi Red Crescent, are essential and multidimensional in handling the cases of cardiac arrest until they reach the hospital. Such position frequently decides on the fate of the patient. The emergency medical services normally kick off their job as soon as a report is received by acti. vating their rapid response system to minimize arrival time. Upon arrival paramedics immediately begin implementing basic life support procedures ,This includes assessing the safety of the scene confirming the patient's unresponsiveness and lack of normal breathing, and immediately initiating

cardiopulmonary resuscitation High quality, and paramedics focus on deep, rapid chest compressions at a rate of 100-120 compressions per minute to ensure continued blood flow to the brain and vital organs. An automated external defibrillator (AED) is also used If available and a shockable cardiac rhythm is confirmed, qualified paramedics will then proceed to apply advanced cardiac life support procedures This includes securing the advanced airway, such as inserting a breathing tube Inserting a venous or intraosseous line Administering life-saving medications such as epinephrine and adrenaline Or amiodarone, according to approved protocols and the heart rhythm shown by the monitoring device. The paramedic also identifies and treats reversible causes of cardiac arrest such as hypoxia, acidosis, electrolyte imbalances, or poisoning3,7

However, during the transfer to the hospital, the ambulance team continues to monitor the patient's vital signs and perform resuscitation procedures in case spontaneous circulation is restored Post-resuscitation care procedures are implemented, such as controlling body temperature, monitoring blood pressure and ,oxygen saturation levels. Crucially, there is direct and early coordination with the receiving hospital providing them with a detailed report on the patient's condition, the procedures performed, andthe time of the cardiac arrest. This communication will make sure that the emergency department of the hospital is ready with specific care pathways, including cardiac catheterization, when the patient arrives at the hospital. This goes a long way into saving the critical time and enhancing survival and recovery. Moreover, the effects of ambulance services go beyond the immediate reaction to cases; training and assessment of the quality of the services are also included. They offer frequent and specialized training of paramedics on the most recent cardiac resuscitation and advanced care guidelines Data on the success of ambulance teams in every cardiac arrest case are also analyzed and an evaluation of performance is given to identify areas of improvement. These organizations are significant and crucial in creating community awareness and educating the people about basic CPR skills to ensure that there are effective first responders in the neighborhood to decrease the duration of critical time required before the ambulance can reach the scene7,10.

- **Capabilities and equipment of Saudi Red Crescent teams for responding to cardiac arrest before hospitalization**

The Saudi Red Crescent teams possess advanced and standardized capabilities and equipment aimed at providing the highest level of care for cardiac arrest cases before reaching the hospital The Saudi Red Crescent teams rely on highly qualified and experienced medical personnel who receive intensive and continuous training in advanced cardiac life support protocols Basic life support Modern ambulances are equipped with advanced basic equipment including defibrillators and monitoring screens. These advanced ,devices can analyze heart rhythm, deliver the necessary electric shock in case of ventricular fibrillation and monitor the patient's vital signs such as electrocardiograms Blood pressure, oxygen saturation, and mechanical resuscitation equipment are also monitored. In some advanced teams, automated chest compressions are used to ensure high-quality, consistent, and continuous CPR during transport especially in prolonged cases or difficult transport conditions. The advanced care teams at the Saudi Red Crescent also possess these capabilities The ability to go beyond basic procedures and provide the necessary .pharmacological and non-surgical interventions to save the patient's life, including emergency medications where ,Ambulances carry a list of vital and controlled medications according to approved medical protocols such as epinephrine, amiodarone, or atropine, which are administered intravenously or via intraosseous access. Paramedics are trained on intravenous access to overcome the difficulty of accessing the vein in cases of stroke and advanced airway management Paramedics can secure the airway of a patient unable to breathe effectively through advanced techniques such as tracheal intubation or the use of supraglomerular devices to ensure optimal ventilation and oxygenation of the brain during resuscitation7,4

In addition, operational and technical readiness is the third pillar, where the authority uses modern systems to reduce response time and increase process efficiency through smart reporting applications such as "As'efni" and "Al-Mustajeb" where These applications contribute to accurately locating the patient and

delivering ambulance teams to them as quickly as possible and can also connect first responders from the nearby community to provide initial assistance Before the ambulance arrives, the medical control system also enables direct communication between paramedics on site and the supervising physician in the control room, where monitoring readings are reviewed and digitally transmitted to the hospital to ensure appropriate treatment decisions are made in real time, such as activating the cardiac pathway The patient was immediately transferred to the catheterization lab, and the hospital was prepared to receive the case8,5

- **Protocols and procedures approved for managing cardiac arrest outside of hospital**

Emergency medical services organizations such as the Saudi Red Crescent rely on globally standardized and up-to-date protocols and procedures derived from the American Heart Association guidelines or the European Recovery Council To ensure effective and organized management of cardiac arrest outside the hospital, immediate action is taken by activating the basic life support protocol, which forms the basis of the chain of survival, through rapid recognition and seeking assistance Confirm the absence of consciousness and normal breathing, then immediately call 997 and perform CPR High quality and ,Immediately begin chest compressions at a rate of 100-120 compressions/minute and a depth of 5-6 cm minimizing any interruptions in compressions and eliminating premature defibrillation by connecting an automated external defibrillator (AED As soon as a manual monitoring device is available or used by the paramedic, and if the device indicates a shockable rhythm such as ventricular fibrillation, the shock should be administered immediately. At this stage, the focus should be on the quality of the compressions The speed of defibrillation is the most critical factor in determining patient survival, and the ambulance team then moves to advanced cardiac life support protocols that involve more intensive intervention through securing the airway and advanced ventilation Secure the airway using tracheal intubation tubes or .supraglottic devices to ensure adequate oxygenation and ventilation while avoiding over-ventilation Lifesaving drugs such as epinephrine or adrenaline are administered intravenously or intraosseously and repeated according to protocol and heart rhythm. Antiarrhythmics such as amiodarone are given. If the shockable rhythm persists after initial shocks, continuous evaluation is then carried out to look for and treat underlying causes that may have led to cardiac arrest, such as hypoxia hypovolemia, poisoning, or coronary artery thrombosis5,2

When resuscitation efforts are successful and spontaneous return of blood circulation is achieved The protocol directs paramedics to a crucial stage aimed at protecting the brain and heart until reaching the hospital by maintaining blood pressure and oxygen levels within normal ranges using fluids and blood pressure-raising medications Appropriate oxygen and temperature control, as in many cases paramedics begin to apply measures to lower body temperature or prevent it from rising. This is a crucial neurological procedure aimed at protecting the brain from damage caused by lack of oxygen. Then, arrangements are made to immediately transfer the patient to the nearest medical center equipped to perform specialized treatment such as emergency cardiac catheterization to open blocked arteries, with continued monitoring and advanced care during transfer3,6

- **The competence and training of Red Crescent healthcare practitioners in managing cardiac arrest**

The authority relies strictly on standardized international and local training programs to ensure the competence of paramedics throughout the Kingdom. These programs include basic life support, and this training is mandatory and ongoing, focusing on mastering cardiopulmonary resuscitation (CPR) techniques High-quality training, effective and rapid use of an automated external defibrillator (AED), and advanced cardiac life support are covered in this program which is a standard for advanced param edics. They also develop superior growth in airways management, venous and intraosseous access, complex cardiac arrest algorithms and reversible causes of stroke identification and treatment. These certifications are periodically revised to make sure that practitioners are in touch with the recent world practices and recommendations on emergency medicine. The training itself does not solely focus on theory but emphasizes the practical training a lot with the help of highly realistic simulation scenarios. This form of training is to train decision

making skills in the team where paramedics will go through real life situations of cardiac arrest and be trained on how to make an effective decision under pressure, how to share the roles in the team, and how to make smooth flow of activities collectively. This is important in minimizing the time of interruption during resuscitation compressions. The paramedics are highly trained about tracheal intubation to control the airway and intravenous insertion of the needle into the bone to administer drugs and fluids with the help of the sophisticated models of simulation1,4. In addition, the authority has a rigorous system in place to ensure quality performance and evaluate the efficiency of paramedics in dealing with cardiac arrest through case reviews. Data for each cardiac arrest case is analyzed, such as response time and compression quality The rate of spontaneous return of blood circulation, as recorded by the monitoring device To identify strengths and areas for improvement and implement continuing education programs, all health practitioners are required to complete certain hours of continuing medical education annually often including specific updates in cardiac arrest management and critical care, and paramedics undergo periodic assessments by qualified supervisors to ensure their adherence to standard protocols and to keep their clinical skills sharp and effective10,8

- **Factors affecting the speed of response and quality of emergency medical services in cases of cardiac arrest**

The speed of response and efficiency of pre-hospital emergency care for cardiac arrest cases are affected by a range of factors, including the efficiency of the reporting system The 997 emergency call system or the "As'efni" (Help Me) app can quickly and accurately locate the caller and direct the nearest qualified ambulance unit, including the use of geolocation systems Advanced technology, as well as geographical distribution and starting points through The density and distribution of ambulance centers in urban and remote areas: the closer the ambulance teams' starting points are to population centers, the shorter the response time and the impact of traffic and infrastructure factors Which is represented by Traffic congestion and difficulty accessing certain locations, such as large residential complexes or remote areas, play a significant role. To overcome these challenges, motorcycles and sometimes air ambulance teams are relied upon. Factors related to the quality of clinical care and ambulance services also play a role. These factors relate to the ambulance team's ability to effectively and efficiently perform resuscitation procedures upon arrival, including the quality of cardiopulmonary resuscitation (CPR), adherence to standards for chest compressions (depth or rate), and minimizing interruptions. Compression quality is considered the most important indicator of cardiac arrest outcomes, as is the availability and proficiency of equipment and Ensuring that all vital equipment, especially defibrillators or monitoring devices and medications, is ready for operation and effective, and assessing the paramedics' proficiency in using automated resuscitation devices and securing advanced airways, and the team's commitment to correctly and promptly applying advanced cardiac arrest treatment algorithms, including rapid diagnosis of shockable and non-shockable rhythms and administration of medications7,1

,include societal factors and coordination. These factors encompass the role of the surrounding community the level of integration between the Red Crescent and hospitals, and the participation rate of first responders. When a non-paramedic begins CPR before the arrival of an ambulance, survival rates increase significantly. Red Crescent community awareness programs also play a role in raising this rate, as does coordination with healthcare facilitiesEfficient communication and coordination with the medical control room and receiving hospitals, as sending the patient's condition report and initial ECG before arrival allows the hospital to immediately prepare the catheterization or critical care team, as well as care after spontaneous return of blood circulation and quality of care provided during transport after the patient's pulse returns, such as temperature control and blood pressure support to prevent damage to the brain and other organs6,7

- **Field and logistical challenges faced by Red Crescent teams in dealing with cardiac arrest**

Saudi Red Crescent teams in the field face a number of challenges that affect the speed and efficiency of handling cardiac arrest cases before hospitalization. These challenges include geographical limitations and

accessibility, with the difficulty of reaching the patient in a timely manner being one of the biggest obstacles facing ambulance teams, such as the difficulty of accurately determining locations Despite technological advancements, challenges remain in accurately and quickly determining location in some neighborhoods or remote areas that may lack clear addresses or suffer from weak network coverage, leading to response time delays and traffic congestion In large cities, heavy traffic congestion and poor cooperation from some .drivers can hinder ambulance crews from reaching patients in critical minutes during cardiac arrest Additionally, the locations of these incidents may be unsafe, such as complex road accidents or rugged ,terrain, requiring extra time to ensure the safety of paramedics before initiating resuscitation. Furthermore there are challenges related to the quality of CPR and physical exertion. High-quality CPR demands significant physical effort and concentrationposing challenges for field teams, such as the physical strain on paramedics Continuous, deep, and physically strenuous chest compressions can lead to a decrease in the quality, depth, and rate of compressions over time, reducing the chances of saving the patient especially in prolonged cases with limited staff. Some emergency units may be forced to handle cardiac arrest with a small team, typically two paramedics, making it more difficult to perform all advanced resuscitation .procedures, such as intubation, medication administration, and monitoring, simultaneously and efficiently This also contributes to lower rates of public initiation of CPR Before the ambulance arrived, this means that the brain may have already been exposed to a severe lack of oxygen for a long time before advanced medical intervention began5,7

There are logistical, technical, and coordination challenges. These challenges relate to resource and .technology management, integration with the wider health system, and coordination with hospitals Paramedics may face challenges in ensuring appropriate hospital admission for complex cases, especially those requiring urgent cardiac catheterization This requires significant effort in coordinating between the paramedic, the control room, and the receiving hospital, as well as in maintaining and ensuring the availability of advanced equipment. Despite the availability of advanced devices, ensuring the readiness and maintenance of all complex equipment, such as automated resuscitation devices and monitoring equipment, in the changing field work environment presents an ongoing logistical challenge, in addition to data management and documentation Whereas Time pressure during cardiac arrest may affect the accuracy and completeness of documenting all procedures taken, such as recording times of medication administration and shocks, which is essential for reviewing and improving the quality of care6,7

- **The impact of technology and medical communication on improving pre-hospital cardiac arrest management**

The application of the latest technology and telemedicine systems is a significant factor in radically changing the efficiency of managing pre-hospital cardiac arrest. The tools have facilitated quicker response time, better quality of care provision and the most crucial aspect of saving patients lives directly which is the reduction in the critical response time. This is done by intelligent reporting application and geolocation system It has become possible to identify the location of the caller with extreme precision and send the closest qualified ambulance unit as soon as possible overcoming the difficulties linked to vague addresses. Moreover, the central control room monitoring systems have made it possible to dynamically analyze the traffic and allocate the resources to make sure that the ambulance team is delivered within the critical minutes. Such systems are also capable of alerting the near first responders who may be qualified to initiate CPR before the ambulance arrives which is also a crucial intervention to reduce brain damage. The quality of clinical care and accuracy of diagnostics in the field has also improved the use of technology, since modern medical monitoring devices help paramedics transmit ECGs, which allows the physician to make an immediate decision regarding the diagnosis of acute myocardial infarction A complete 12-way wireless connection before the patient arrives right in the operating room will help in this regard. The use of advanced defibrillators has a feedback technology of the quality of cardiac resuscitation which help to direct the paramedic to change the depth and speed of chest compressions to ensure the highest quality standards are always attained6,4.

Also, technology has been useful in enhancing the support of logistics and the enhancement of human efficiency Advanced equipment like mechanical resuscitation devices assisted in giving the best and sustained chest compressions when transporting the patients so that the paramedics are able to concentrate on other complicated processes during the transport. On the quality management part, all the response and resuscitation data generated by medical devices on every cardiac arrest case are documented and examined. This big data is utilized to assess the work of ambulance teams, detect the deficiencies in implementing the protocols, and plan the further training and simulations programs in a specific direction to make the work of health practitioners more efficient and improve the survival rates in the long run 7,5.

Methodology

The proposed study follows descriptive methodology with an aim of describing the present day reality of handling cardiac arrest cases prior to hospitalization in the Saudi Red Crescent Authority. The study relies on surveying and review of the existing research, scientific literature, and governmental reports on pre-hospital emergency medical services without fieldwork and primary data. The descriptive method allows to provide a clear image of current practices, difficulties, strengths, gaps in pre-hospital cardiac arrest management, which can be used to understand the current situation better and work towards the improvement in the future.

- **Results and recommendations for improving the handling of cardiac arrest cases in the Saudi Red Crescent**

:Results

- The study showed increased efficiency in the ambulance control system, as the average response time was reduced to below the regional average, although there is still a disparity between urban .and remote areas
- .The study revealed a rise in the percentage of cases where cardiac resuscitation was initiated With ideal depth and speed standards, especially with the use of monitoring devices equipped .with feedback technology
- The results confirmed the success of the protocol followed in activating the direct transfer .pathway for patients suspected of having acute myocardial infarction To catheterization .laboratories, which reduced the time required to reperfusion the artery
- The results indicated that the percentage of cases that received resuscitation from a member of the public before the arrival of the ambulance still needs to be significantly increased to match .global levels, indicating the need to intensify community awareness programs
- The study revealed some challenges related to standardizing and ensuring the completeness of electronic documentation of all case variables, such as times of medication administration and .patient condition, under the pressure of field work that the paramedic is exposed to
- The study demonstrated a relationship between the number of hours of simulation-based practical training that a paramedic receives and the extent of their adherence to cardiac arrest .treatment algorithms in the field

: Recommendations

- The number of training courses aimed at the general public should be increased and made more accessible, especially in public complexes and facilities, with the goal of raising the rate of .bystander CPR initiation To global standards, which reduces the time it takes for blood .circulation to stop before paramedics arrive
- Work must be done to improve the accuracy of the GPS system in areas with less developed .infrastructure to ensure reduced response times across the Kingdom

- The need to expand the use of automated chest compression devices In all advanced ambulance units, to ensure the continuity and consistency of resuscitation pressures during transport and to .reduce physical strain on paramedics
- High-fidelity simulation-based training should be incorporated into the periodic evaluation of ambulance team performance, with a focus on reviewing electronically recorded CPR quality .data to ensure staff adherence to the latest protocols
- .Ensuring the complete integration of the medical data transmission system is essential From ambulance to specialized hospitals to activate critical care pathways such as cardiac .catheterization without any bureaucratic delays
- Patient management procedures after pulse restoration must be standardized, particularly with .regard to the application of target temperature control measures During transport to minimize nerve damage.
- The need to update the field documentation system to be easier and faster to ensure that all clinical and logistical data are recorded accurately and completely without affecting the course of .life-saving medical procedures

Summary

The study showed that the success rate of pre-hospital cardiopulmonary resuscitation remains limited compared to global rates, and this is related to several factors, including delayed reporting, the distance of accident sites, and the lack of public awareness of how to act in the first moments of cardiac arrest. It also showed that the time of field response is an important factor in the survival of the injured person. The study emphasized the importance of developing continuous training programs for paramedics in advanced resuscitation techniques and equipping all ambulances with automated external defibrillators, in addition to enhancing community awareness through first responder programs to encourage civilian intervention before the arrival of medical teams. The study recommended establishing a national registry for pre-hospital cardiac arrest cases to improve the quality of performance and monitor long-term survival .indicators

align with the Kingdom's Vision 2030 in the area of quality of life and health sector development, which seeks to build an integrated health system focused on prevention, rapid emergency response, and improving survival rates. Enhancing the capabilities of Saudi Red Crescent teams in dealing with pre-hospital cardiac arrests is a practical translation of the National Transformation Program's objectives in developing emergency ambulance services andincreasing geographical coverage of smartness with the latest technologies. The investments into training of the national staff and qualification of first responders helps to increase the efficiency of the field work according to the vision which puts people in the first place and focuses on the creation of the safe, healthy, and sustainable society. Therefore, the establishment of early cardiac reaction plans and the mobilization of community consciousness plans are the critical pillars in the implementation of the collective national ambulance system to help the vision by alleviating mortality rates and enhancing the quality of health services offered to people and citizens of the Kingdom.

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