



## Emergency Medical Service System in the Kingdom of Saudi Arabia

Authors

**Mohammed Al Mutairi, Ayman Jawadi, Nesrin Al Harthy, Farhan Al Enezi, Nawfal Al Jerian, Abdullah Al Qahtani, Abdullah Al Harbi, Abdullah Al Anazi**

King Saud bin Abdulaziz University for Health Sciences, Riyadh, Kingdom of Saudi Arabia

Corresponding Author

**Dr Mohammed Al Mutairi**

### Abstract

*Acute healthcare delivery system in Kingdom of Saudi Arabia starts up from the prehospital/ preclinical scenario in a village level and extends up to quaternary care medical, through state of the art emergency medical services. These quaternary care hospitals, located in urban areas, are considered the last referral points for the patients from nearby cities and states. As the incidence of motor vehicle accidents in Saudi Arabia have increased in recent years, the role of emergency medical care becomes vital in saving precious lives. The emergency services infrastructure needs professional adequacy for timely provision of quality care to critical patients is considered as the main agenda all over. This review looks in to the past, present and future perspective of emergency medical services in Kingdom of Saudi Arabia.*

### Introduction

The Kingdom of Saudi Arabia is listed as the 14th largest country in the world with an area of 2,240,000 sq.km<sup>(1)</sup>. It has the largest oil reserves (about 20% of the total in the world) and plays a leading role in Organization of the Petroleum Exporting Countries (OPEC)<sup>(2)</sup>.

As of July 2015, Saudi Arabia's population exceeded 31 million. The Saudi population is young, with around 50% under the age of 20. Approximately 55.3 % of Saudi nationals are males and 44.6% are females. Nearly 88% of the total population is urban. Population growth rate is estimated to be around 2.06% with a birth rate of 2.91 births per 1,000 populations, and a death Rate of 2.55 deaths per 1,000 populations<sup>(3)</sup>. Out of a total population of 27,136,977 about

8,429,401 are foreigners. Eighty two percent of the whole population lives in urban areas.

Saudi Arabia has a huge influence not only on the Gulf countries, but on the whole Islamic world from militarily aspects to economic and political aspects. Although, English is widely spoken, the official language in Saudi Arabia is Arabic<sup>(4)</sup>.

Since the two holy cities Mecca and Medina are located in the west part of the Kingdom, Saudi Arabia is the birthplace of the Islamic faith where over 2 million pilgrims perform Hajj every year.

### Overview of the Health Care in Saudi Arabia

The health care as an organized structure began in 1926 in Mecca with the issuance of a decree establishing "health care department" by the first King of the country, King Abdul-'Aziz which was

one of the highest priorities to him. This department was in charge of setting up free hospital and health care facilities for the population and the pilgrims in Madinah, Mecca, Jeddah and Taif. After that, in 1927 the health care department was renamed to “ General Directorate of Health and Aid” Due to the very limited budget, progress in health care development was obviously slow; the total number of hospital beds back in 1946 in all health care facilities was 300. However, by the year of 1950, hospitals had been established in all the major cities of the country and there were almost 111 physicians and about 1000 beds by that time<sup>(5)</sup>. The next significant step in the process of improving health care was the establishing of Ministry of Health (MOH) in the year 1950 under another Royal Decree. After 20 years of establishing the MOH, the nation's first development plan has begun in 1970-1975 which targeted all national sectors aiming to create another source of income other than the oil and since then the health care has been achieving consequential improvements<sup>(6)</sup>. In 2011, the MOH budget was SR39,860,200,000 which made around 7% of the total budget of the country<sup>(7)</sup>. The total healthworkers employed by the MOH (including physicians, nurses, pharmacists and allied health professionals) increased by 50.8% between the years 2008 and 2012, with an addition of 56,129 personnel<sup>(8)</sup>. According to the World Health Organization (WHO) the Saudi health care system is ranked as the 26th among 190 countries, and was above to many other international health care systems such as that of New Zealand<sup>(41)</sup>, Australia<sup>(32)</sup> and Canada<sup>(30)</sup><sup>(9)</sup>. The MOH is the leading governmental agency that is responsible for managing finance planning and coordinating all health sectors, in addition to supervising the private health care sectors. It is also considered as the national health services (NHS) agency for the whole population. In addition to MOH, there are other NHS agencies that fund and deliver health care to people who serve in security and armed forces in their

respective modes, and to name some; The Saudi National Guard (SANG) the Ministry of Interior (MOI) and the Ministry of Defense and Aviation (MODA)<sup>(5)</sup>.

### Emergency Medicine

The development of Emergency medicine, as a specialty in Saudi Arabia is very impressive. Until 2004 there were only four qualified Saudi Emergency physicians but by the year of 2013 the number has increased to almost 70 Saudi emergency physicians who had received training in Europe, North America and Saudi Arabia<sup>(10)</sup>. Governmental emergency care system is based on two levels: 1-Nationwide network of primary health centers (PHC) which provides prenatal and emergency services beside the mobile clinics to reach out the rural areas of the country. 2-Specialized hospitals in the main cities, where they have emergency medicine departments to provide 24 hours coverage for acute medical conditions and trauma caused by road accidents, which occupies one-fifth of MOH beds at any time<sup>(11)</sup>, falls, collapse of buildings or burns. The Saudi Red Crescent Authority (SRCA) has a complementary part offering first aid and transportation for all victims<sup>(12)</sup>. Hospitals are an essential key factor playing a major role in the health care scenario and they take part in a chain of Emergency Medical Care services that includes: Call 9-9-7, Dispatch of EMS team, Prehospital emergency care and Hospital based emergency care<sup>(13)</sup>. Therefore, it is critically important to the health of any country to have these elements connected in order to have better outcome. Over the last few years, the role of hospital-based, prehospital and trauma emergency care has expanded. The function of Emergency Department (ED) is to receive, triage, support and provide urgent and immediate intervention to emergency conditions so it will lower the risks and increase the chances of better outcomes<sup>(14)</sup>. In 2006, there were more than 31 million visits to PHC and over 15 million ED visits across the country and it was a challenge for MOH to deal

with the ED overcrowding especially at tertiary hospitals. In a survey conducted in Riyadh, according to 50% of ED directors, overcrowding is always present in their departments and 40% of them reported that it is often a problem (15). From patient's perspective, many of them prefer to go straight to tertiary hospitals rather than going to PHC, with the assumption that they'll get better care at tertiary facilities. Some of the crowding factors in ED include non-emergency complaints, inability to transfer the patient to inpatient bed resulting in long period of waiting, unnecessary ED visits, shortage of ED staff and not well equipped emergency rooms (16). The EDs around the country continue to focus on their key mission of offering emergency care for acutely ill 24/7/365 without any discrimination by economic or social class. Many of the departments have added up responsibilities to meet the need of societies that includes public education and awareness and updating and upgrading public health agencies to prepare them for self-care and injury prevention and limitation in case of any possible disaster that can overwhelm the system (17).

### **Emergency Medical Services Structure**

The concept of Emergency medical services (EMS) wasn't new to the Kingdom; it was first brought into the country by a charitable aid society back in 1953 which was the pre formation of SRCA (18). EMS systems globally have been categorized into two main categories since early 1970s. The Anglo-American model which is based on load and go approach and the Franco-German model which is based on stay and play approach. The Anglo-American model focused to bring the patient to hospital and was run by paramedics under medical supervision whereas the Franco-German model was based on bringing the hospital to the patient and was usually staffed by medical doctors (19). Many studies have attempted to compare between the two models in terms of cost effectiveness and patient outcomes (20-23). However, there is no evidence now to distinguish the superiority of one over the other

and it depended mostly on the resources and the community needs and which system would fit the specific community (24). Emergencies mostly occur due to injuries, infections and complications of long term diseases or even a chemical imbalance. EMS professionals have to manage these conditions by rapid assessment, well-timed intervention and immediate transportation to the appropriate closest facility via the easiest path for the patient's better outcome (25). The pre hospital setting is a dynamic environment that faces a lot of challenges to offer a safe, high quality medical care in emergency scenarios. The challenges in pre hospital setting require a well-designed system that can handle any medical emergencies very well.

From the populated urban cities like Mecca and Riyadh to the most rural areas in the northern borders of Kingdom, EMS treats and transfers more than 70,000 cases per year to hospitals which include Public, Military, and National Guard facilities (26). EMS in Saudi Arabia is maintained by all the hospitals, through SRCA and is free of charge for citizens and residents of the Kingdom (27). The EMS team generally includes an emergency physician, paramedics, technicians, firefighters and ambulance drivers (28). The EMS system in Saudi Arabia suits more the Anglo-American model which consists of ambulances staffed with Emergency Medical Technicians (EMTs) and Paramedic who are trained in basic, intermediate and advanced life support. They provide out of hospital care which includes stabilization, intervention and transportation of victims to the hospital for further management. The expertise levels of EMS services available in Saudi Arabia are BLS (Basic life Support) and ALS (Advanced life support) ambulances, dispatched on the needs of the patients. The BLS ambulance adapts load and go approach and is usually dispatched to those need non-invasive intervention with rapid transportation. They are able to perform cardiopulmonary resuscitation (CPR), oxygen administration, wound management and fracture splinting. The

higher level of prehospital care is delivered by ALS ambulances with the concept of stay and play approach. In addition to all BLS procedures, ALS ambulances are equipped with personnel and devices for emergency invasive procedures such as endotracheal intubation, needle decompression, fluid replacement and administration of certain medications<sup>(29)</sup>.

### **Saudi Red Crescent Authority and its role in the Kingdom**

Saudi Red Crescent Authority (SRCA) is the national agency that provides EMS in Saudi Arabia, established in 1963 by the royal order. It emerged from a charitable aid society that was founded in 1953<sup>(30)</sup>. However, in 1966 the SRCA became the 91th member of the International Red Crescent and Red Cross societies' league. The International federation of Red Cross and Red Crescent Societies is a non-political entity that aims to contribute to the development of humanitarian activities in different aspects by reaching millions of people who suffer from disasters, wars, epidemic and pandemic outbreak of diseases and providing first-aid<sup>(31)</sup>. The SRCA headquarters is located in Riyadh and has 13 administrative units in various regions within the Kingdom. The authority is able to handle any emergencies with well trained professionals and well-equipped vehicles<sup>(32)</sup>.

Since the SRCA is an assistance agency to all other medical organizations in the Kingdom, one of its goals is to have the system alert and ready for any emergencies at any time. Another goal is to co-work with other Red Crescent agencies, in cases of worldwide disasters, wars with no discrimination. The agency has its own practices to participate in fighting epidemic diseases in conjunction with medical organization to vaccinate people and work for public awareness<sup>(33)</sup>.

The authority is considered a governmental agency in which most of its budgets are aided by government, except private contributions. It was reported that budget of SRCA rose up from 373

Million US dollars in 2009 to 433 Million US dollars in 2010 to cover the operations costs inside and outside Saudi Arabia<sup>(34)</sup>. According to annual report of 2015, the SRCA has a total of 6754 staff members, who includes 1683 administrators, 86 physicians, 4164 technicians and other workers to manage a total of 328 first aid centers across the country with 1058 EMS ambulances<sup>(35)</sup>. The Central Radio Communication Room (CRCR) gets emergency calls via different means, for example, through dialing the free 9-9-7 number or through the CRCR of the police, firefighting departments or car accident departments (CAD), or even sometimes patients come to the station by themselves<sup>(36)</sup>. It was identified that more than 70% of calls required transport for same victim and about one-fourth resulted in no victims being transported<sup>(37)</sup>. Also Statistics from the MOH confirmed that more than 50,000 medical emergencies were transferred by bystanders and police vehicles instead of the SRCA ambulances<sup>(38)</sup>. Therefore, the system has adopted an ALS model in large cities of the country (Jeddah, Riyadh and Dammam) and assigned foreign physicians to work as EMS personnel and train the existing personnel in advanced prehospital care. And this resulted in enhanced quality of care as well as public trust in the system. The CRCR staffs assign calls to a certain station based on the place where the call originates from and their judgment.

In order to make filling out the forms easier and more effective, SRCA use a coding system for the type of calls and the receiving facilities. Regarding incidents, it consists of 40 code numbers.

For example: code number 1 for explosives and code number 40 for death. The receiving facilities are also coded; for example, the code 14 for King Khalid hospital, 15 for King Faisal Specialist hospital and 16 for King Fahd hospital<sup>(39)</sup>.

### **Education and Training**

The rising demand for health care professionals has been recognized as a worldwide problem. Since 1967 when first medical school was

established at King Saud University in Riyadh, it became a national priority to implement health care education by establishing medical schools throughout the country. Currently, there are 31 medical schools that offer medicine, nursing and applied medical courses such as emergency medical services and laboratory sciences<sup>(40)</sup>. A formal education in EMS was established in early 2000, focusing the need for improvement the EMS system as well as for the reinforcement of public trust and awareness.

EMTs have been described as physician surrogates at the scene of an accident<sup>(41,42)</sup>. It has been mandated by legislation of The United States and The United Kingdom that EMTs must work under the supervision of a licensed physician and it has been recommended that EMS physicians / medical directors must be specialized in emergency medicine. The medical director's involvement in the pre-hospital emergency care setting includes educational and personnel certification, participating in improving protocols, procurement and approval of technological standards and monitoring and supervising the medical directives<sup>(43)</sup>. The emergency medicine institute (EMI), recognized by Saudi Council for health specialties was established in 2002 was the first and the only specialized institute responsible for education and training of EMS personnel. A few years later, with the noticeable increase in the need of well trained and qualified EMS personnel, Saudi universities started to adopt Bachelor of Science (B.S.) courses in EMS. The first B.S. program in EMS in the country was started in King Saud bin Abdul-Aziz University for health science in Riyadh, under Ministry of National Guard-Health Affairs. The College adopted the EMS program of Flinders University in Australia with the intention of promoting high standard EMS at national and international levels. Later in 2009, Prince Sultan bin Abdul-Aziz College of EMS, under King Saud University started B.S. in EMS.

With its world class simulation center and life support training center, Prince Sultan College is

an excellent contributor towards the healthcare sector, especially towards EMS. University of Dammam on the east province too offers B.S. in EMS to address the scope and increased demand of prehospital emergency care.

### **Hajj mission**

The mass gathering of people for religious purposes such as Hajj in Islam or worldwide sports events like Olympic Games brings a unique challenge to the host county<sup>(44)</sup>. Hajj is a mass gathering of people visiting Mecca annually for religious propose. It is obligatory for every adult Muslim who is able physically and financially to perform Hajj at least once in a lifetime<sup>(45)</sup>. It is an annual event that takes place in Mecca in the 12th month of Islamic calendar and it lasts for few days. However, Hajj is one of the largest most diverse mass gatherings in the world with over 2.5 million pilgrims gathered in an area of 550 KM in Mena from around 160 countries every year<sup>(46)</sup>. This mass migration became one of the world's most important infection-control and public health problem since the 1<sup>st</sup> January of 1957 when Mecca pilgrims started to get the attention of international health authorities and the regulations that are set by WHO. Even though Hajj takes place in a small area, the overcrowding mass of pilgrims raises the high demands of environmental and physical healthcare. Transmission of diseases (airborne agents) increases during Hajj due to the long stays in Hajj sites, overcrowding and heat waves. Food poisoning and diarrhea are typically common during hajj due to traffic jams and bad food storing<sup>(47)</sup>. Every year when hajj season starts, it receives a combined attention from different governmental and non-governmental sectors of the Kingdom from various aspects. The Ministry of Hajj is the responsible sector for Hajj activities with collaboration of all governmental agencies<sup>(46)</sup>. The Kingdom of Saudi Arabia provides appropriate healthcare to pilgrims. Many hospitals and mobile clinics are set in various spots during Hajj. These centers are run by MOH with different sectors including Red Crescent,

Medical department of Ministry of Interior, Civil defense and National Guard working together to cover the need of pilgrims by promoting high quality healthcare. The MOH mission during Hajj season is to present the best health care and initiate Emergency and disaster management plans with collaboration of other related sectors<sup>(48)</sup>. The preparation for Hajj starts two weeks in advance and MOI is the in charge of all operations during Hajj. During the mission, SRCA hires more than 300 ambulance units, 20 ALS vehicles, 25 motorcycle units and 8 medical helicopters and more than 100 mobile medical teams. In 2012, SRCA placed 1,750 EMS staff and 600 volunteer throughout the region. One of the challenges that EMS face during pilgrimage is in term of transportation. SRCA utilize different systems of transportation and management of emergency cases beside ground based vehicles. SRCA uses medical helicopters to transfer critically injured or ill patients from different parts along the route. Motorcycles are used for transporting patients from overcrowded areas and these emergency responders are able to perform rapid assessment and transportation.

Another unique challenge is the hundreds of languages that are spoken by over 80 nationalities and to handle this situation SRCA had to make a custom designed book with picture to ease the communication between EMS staffs and pilgrims. With millions of pilgrims it is hard to keep supplies and equipment in stock and even predict the exact amount needed. Estimation of the needed supplies is done by analyzing previous year's consumption of supplies and equipment. All EMS systems are financially supported by Saudi government and is considered to be as humanitarian act<sup>(49)</sup>.

### Conclusion

The implementation of widespread EMS system in Saudi Arabia not only just guarantee better patient safety and clinical outcome, but also will have a positive influence on the health status of our communities, resource utilization, and the

development of prehospital systems, as well as hospital and public health policies. In Saudi Arabia, EMS has advanced as a specialty in its training programs and systems of care compared with other gulf countries.

As Saudi Arabia continues to expand economically, the provision of EMS will soon begin to match more similar as emergency care as practiced in North American and other western countries. Also Saudi Arabian EMS system in future may get established as a benchmark for other Middle Eastern countries, to follow.

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