# Evaluating the effectiveness of notification sorting protocols in the Saudi Red Crescent Authority's call centers and their impact on response time efficiency

**Saleh Yahia Moshabb Alahmad[1], Ibrahim Mohammed Al Shiban[2], Saleh Matar Al Sari[3], Abdullah Yahia Hassan Asseri[4], Raed Yahya Mahdi Al Rubaie[5], Hamad Ali Almahnan Al Duways[6], Ali Mohammed Saeed Al-Qahtani[7]**

[1,2,4,5,6,7]*Technician – Emergency Medical Services – Saudi Red Crescent Authority, Aseer.*
[3]*Paramedic – Saudi Red Crescent Authority, Aseer.*

**Abstract**:

This study aims to evaluate the effectiveness of the triage protocols in the Saudi Red Crescent Authority's call centers and their impact on the efficiency of response time to emergency incidents. The study relied on the descriptive analytical approach in order to provide a comprehensive understanding of the role of these protocols in improving response mechanisms. The questionnaire tool was used to collect data from a sample of (200) individuals working in call centers. The statistical analysis included descriptive statistics (mean, median, and standard deviation) to study the trends of the sample members' responses, in addition to inferential tests such as the T-test and the one-way analysis of variance (ANOVA) to examine differences according to demographic variables. The results showed that triage protocols significantly contribute to accurate case classification, reduced errors, and improved response time efficiency. There were also statistically significant differences in the perception of the effectiveness of these protocols according to the variables of gender and age. The study concludes that continuous staff training and periodic updating of triage protocols, taking into account demographic differences, are essential factors for improving the efficiency of emergency response services. The results underscore the importance of enhancing the operational performance of the Saudi Red Crescent Authority to ensure rapid and quality intervention in managing emergency reports and incidents.

**Keywords**: Report Triage Protocols - Call Centers - Response Time Efficiency - Emergency Management - Emergency Response.

## Introduction

Call centers are the primary and essential source of emergency and relief operations. They constitute the starting point for interaction between the public and response agencies such as the Saudi Red Crescent Authority. The role of these centers is not limited to simply receiving calls, but extends to include triaging and classifying reports according to the degree of danger and priority. The effectiveness of triage protocols is the basic beginning in ensuring a rapid and effective response. Any shortcomings in this process directly affect the efficiency of response time, which is measured from the moment the report is received until the ambulance teams arrive at the site. This is an important and strong indicator of the quality of services provided. Evaluating the effectiveness of triage protocols in call centers of the Saudi Red Crescent Authority represents a pivotal and important topic in the field of emergency management and ambulance services. It not only affects the efficiency of internal operations but also extends to include the quality of services provided to the community and public confidence in the Authority's ability to respond immediately and effectively. This study will analyze data related to response time and compare it with the effectiveness of triage protocols to provide practical recommendations that contribute to achieving a qualitative shift in

the performance of call centers, reflecting the Authority's commitment to providing the highest quality standards in its ambulance services 1,2

## The importance of research

The primary importance of this assessment lies in its direct impact on the efficiency of response time which is the most important indicator for measuring the quality of emergency services. The more precise, clear, and easy-to-apply triage protocols are, the faster and more accurate the report classification will be, ensuring that the appropriate team arrives at the scene as quickly as possible. Periodic evaluation of these protocols also helps identify weaknesses, gaps, and challenges that may lead to delayed response. For example, the assessment process may reveal ambiguity in some triage criteria, the unsuitability of protocols for new emergency situations, or even insufficient training provided to call center staff. Addressing these points enhances staff's ability to make quick and correct decisions, which reduces time wasted on calls and enables the immediate and rapid dispatch of necessary resources, such as ambulances or rescue teams. Furthermore, the direct impact of the effectiveness of triage protocols on response time is a causal relationship that cannot be ignored. Incorrectly triaging a report of a critical condition, such as a cardiac arrest, as a normal case may result in a delay in the arrival of the ambulance, which may have life-threatening consequences. However, if the report is triaged correctly, it is given top priority and a specialized medical team is dispatched. As soon as possible, which greatly increases the chances of saving the patient 3,6

The importance of protocol evaluation is evident in its contribution to improving the use of available resources, which is an alternative to sending a fully equipped ambulance team to a case that does not require it. Accurate triage can direct appropriate resources to the correct case, saving time and effort and ensuring the readiness of other teams for more serious cases. This improvement in resource allocation positively impacts the efficiency of the system as a whole. Therefore, evaluating the effectiveness of triage protocols aims primarily to raise the level of emergency services provided by the Saudi Red Crescent Authority and enhance community confidence in the Authority's ability to respond immediately, quickly and professionally to emergencies. Investing in improving these protocols is not merely an administrative procedure, but rather a direct investment in saving lives and improving quality of life 5,8

## Discussion

Emergency medical call centers, also known as operating rooms, are the foundation of the emergency relief and response system. Their traditional role goes beyond receiving phone calls to include a comprehensive set of vital tasks that ensure a rapid and effective response the moment the first responder, the call center employee, receives the call. This begins a series of complex procedures that require precise and high concentration and quick decision-making. The primary role is to sort and classify the calls  The center's staff uses specific protocols to assess the severity of the case based on the initial information provided by the caller. This precise triage prioritizes critical cases such as cardiac arrests or traffic accidents, giving them top priority to dispatch emergency teams immediately and quickly. These centers also provide initial medical guidance to callers. Often, the caller can provide initial assistance to the injured person before the ambulance teams arrive. Here, the call center employee, who is often trained in first aid, guides the caller step by step on how to deal with the case, whether by providing cardiopulmonary resuscitation(CPR)  or stopping bleeding, which may save the injured person's life 8,9

The centers then direct and coordinate the response teams at the scene of the accident. After triaging the report, the nearest available and qualified ambulance team is identified and provided with all the necessary details about the accident location and type of injury. This coordination takes place in real time using GPS  systemsand  advanced communications technologies to ensure the team reaches the site as quickly as possible. All reports and related data are then recorded and documented , allowing for pattern analysis, evaluation of response efficiency, and identification of future needs for human resources and equipment. This periodic analysis contributes to continuous improvement 8,10

Therefore, emergency medical call centers are the hub around which all relief efforts revolve. They are not just automated answering machines, but rather a complex system that combines advanced technology and human expertise to ensure a rapid, effective, and organized response. The centers serve as a central operations room to coordinate relief efforts among various stakeholders, such as civil defense, police, and hospitals, ensuring an integrated and organized response 10,2.

## Report Screening Protocols: Foundations and Standards

Emergency medical call center triage protocols are based on specific principles and standards to ensure an effective and rapid response. This triage aims to determine the severity and priority of the case based on the information available from the caller. The most important principles and standards can be explained as follows 4,2:

Severity classification is the basic standard for triage protocols. Reports are divided into several levels: critical cases with a red code, which include cases that directly threaten life, such as cardiac arrest, severe bleeding, loss of consciousness, or major burns. These cases require an immediate response with the highest level of equipment, and urgent cases with a yellow code  It includes cases that require rapid medical intervention but are not immediately life-threatening, such as fractures, choking cases, or moderate injuries. It also includes non-emergency cases with a green code, which include cases that do not require an urgent response, such as minor injuries or chronic diseases that do not pose an immediate danger. Therefore, the criteria for assessing the case are based on the triage process and a rapid assessment of the basic information provided by the caller, including the patient's awareness, whether he is suffering from difficulty breathing, whether there is bleeding and its severity, and knowing the age, as emergency cases in children and the elderly are often more sensitive

Therefore, protocols must be clear and standardized for all call center employees. Having a standardized guide reduces variability in decisions and ensures that each report is handled with the same efficiency and accuracy, regardless of the employee who receives it. It also facilitates the training and updating of new employees. Continuous training on protocols is an essential part of the triage process. Call center employees must undergo regular training programs that help them handle all types of reports and teach them how to use the protocols effectively. Protocols must be updated based on medical and technical developments and previous emergency experience. Implementing these principles and standards ensures that each emergency report is handled effectively and that the appropriate resources are directed to the correct case, which directly contributes to reducing response time and increasing the chances of survival and saving lives 8,3.

## Mechanism for implementing screening protocols in the Saudi Red Crescent Authority

The Saudi Red Crescent Authority adopts a precise and systematic mechanism for implementing triage protocols in its call centers to ensure a rapid and effective response to emergency cases. This mechanism begins immediately upon receiving the call from the call center employee, known as the first responder. It represents the first step in the initial assessment of the case, where the responder collects basic information from the caller, such as the nature of the report, the precise location of the accident, and the number of injured. This initial information forms the basis of the triage process Based on the information collected, the responder moves to the immediate classification stage of the report in accordance with approved triage protocols13,14.

These protocols classify cases into various risk levels and assign different color codes to facilitate the decision-making process. During the triage process, the responder asks the caller specific and systematic questions to gather more details that help accurately determine the level of risk. These questions include information about the injured person's awareness, whether he is breathing normally, whether there is bleeding, and any other vital symptoms. These questions are not only intended for classification but also help the responder provide initial medical advice to the caller. This is done in accordance with approved first aid protocols. The responder provides clear and simple instructions on how to provide assistance to

the injured person before the arrival of the ambulance teams, such as how to deal with bleeding or how to perform resuscitation. Cardiopulmonary bypass if necessary 4,6

After determining the level of danger and classifying the report, comes the coordination stage and dispatching response teams. The automated system in the call center identifies the nearest available ambulance team equipped to handle the case based on the type and location of the report. All report details and collected information are sent to the field team via the integrated communications system, ensuring they arrive at the site fully aware of the nature of the case. The field team is tracked via GPSto ensure they arrive as quickly as possible. The application mechanism also includes documentation and follow-up. All call details are recorded and documented from the moment the report is received until the mission is completed and the team returns. This data is then used to analyze performance, evaluate response time efficiency, and identify any weaknesses in protocols or procedures. This continuous analysis contributes to the periodic improvement of the mechanism and ensures the provision of the best possible service, reflecting the Authority's commitment to providing emergency medical care at international standards 9,7

**The impact of protocol effectiveness on response speed**

The effectiveness of notification triage protocols has a direct and significant impact on the speed of response in emergency medical call centers. The relationship between them is strongly proportional. The clearer, more precise, and more efficient the protocols are in application, the faster the response will be and the shorter the time it takes for ambulance teams to reach the accident site. This impact is evident in several key aspects, namely:

Speed of decision-making: Effective protocols enable the call center employee to make a quick and accurate decision regarding the severity of the case, instead of wasting time gathering unnecessary information or randomly trying to understand the nature of the case The protocols direct them towards basic questions that immediately determine the severity of the case, which reduces the valuable time between receiving the report and dispatching assistance 7,3

Allocate appropriate resources Then Effective protocols ensure that the right team and equipment are dispatched to the right situation. If triage is accurate, a team equipped to handle a cardiac arrest is dispatched immediately, while not wasting resources on a less serious situation. This not only reduces response time to critical situations but also ensures that other resources are available for other emergencies that may occur at the same time 7,4

Reducing human error, as clear and unified protocols reduce the likelihood of error in evaluation This is instead of relying solely on the employee's personal experience. Protocols provide a unified framework for evaluation, reducing variation in decisions and ensuring that each report is handled according to the same standards. This enhances confidence in the system and improves final results 5

Effective protocols contribute to improving communication between the call center and field teams. After the report is sorted, clear and concise information about the nature of the case is sent to paramedics, enabling them to be better prepared when they head to the site and speeding up the medical intervention process upon arrival

Effective protocols provide accurate performance measurement, tracking sorting times, team dispatch times, and team arrival times. This data is used to analyze system efficiency, identify any weaknesses, and develop new strategies for continuous performance improvement 9

Therefore, improving the effectiveness of protocols directly leads to reducing response time, which increases the chances of saving lives and reducing health complications for those infected.

**The relationship between sorting quality and resource allocation accuracy**

The relationship between the quality of triage and the accuracy of resource allocation in emergency medical call centers is direct and of vital importance. The quality of triage is the foundation upon which resource allocation decisions are built. The more accurate and effective the triage process is, the more efficient the use of available resources will be, which positively impacts the speed and quality of response. The quality of triage depends on the accurate and rapid analysis of information received from the caller. Instead of treating all reports as having the same level of severity, effective protocols classify them into different levels (red, yellow, green). This accurate classification enables the resources required for each individual case to be determined 7,6.

Accurate resource allocation ensures that life-threatening situations are given top priority, significantly increasing the chances of saving lives. It also helps avoid wasting precious resources. Sending an advanced ambulance to a situation requiring only a minor intervention wastes time and effort and jeopardizes the system's readiness should another emergency occur in the same area. Therefore, triage quality is not limited to speed of response alone; it extends to effective resource management, ensuring that each ambulance team is in the right place at the right time to provide the required care. This interconnected relationship is the foundation of efficient emergency response systems 4,2.

The pre-hospital phase is one of the most critical stages in dealing with emergency situations, as saving a patient's life depends largely on the speed of response and the accuracy of the initial intervention. In this context, the Saudi Red Crescent Authority's call centers play a pivotal role in receiving, classifying, and directing reports to field teams. Effective triage protocols are key to ensuring rapid response, as accurate triage reduces the likelihood of delays and improves the chances of paramedics arriving in time to provide urgent care before the patient reaches the hospital15

Studies have shown that improving triage protocols directly contributes to improving the efficiency of pre-hospital emergency services by reducing response time and increasing the accuracy of dispatching ambulance teams. In critical situations such as cardiac arrest or severe injuries, the first few minutes are crucial in determining a patient's fate. Hence the importance of adopting precise, scientifically based protocols that enable call center employees to make quick and effective decisions, facilitating the dispatch of appropriate teams to the scene with the highest degree of efficiency14

Implementing effective triage protocols contributes to enhancing the quality of pre-hospital care and achieving the goals of the Kingdom's vision for developing the health sector. Increasing the speed of response and improving the efficiency of medical resource distribution will lead to increased community confidence in the Saudi Red Crescent's services, in addition to improving health indicators and reducing mortality and disability rates resulting from delayed intervention. From this perspective, evaluating the effectiveness of these protocols represents an essential step toward developing more accurate and flexible future strategies that support innovation and digital transformation in the field of medical emergencies13

**Study location:** Saudi Red Crescent Authority (call centers).

**Methodology:** descriptive and analytical.

**Tool:** A questionnaire applied to a sample size of (200) individuals.

**Statistical analysis used:** Descriptive statistics (mean, median, standard deviation), and inferential tests (t-test, ANOVA) to measure differences between means.
**Analysis Results**

**Table (1): Descriptive Statistics (N = 200)**

| Item | Mean | Median | Std. Deviation |
|---|---|---|---|
| Q1. Clarity of notification sorting protocols | 3.85 | 4.00 | 0.95 |
| Q2. Protocols reduce time wasted in triage | 3.70 | 4.00 | 1.05 |

| | | | |
|---|---|---|---|
| Q3. Improved communication between paramedics and dispatchers | 3.95 | 4.00 | 0.90 |
| Q4. Protocols contribute to faster response time | 4.10 | 4.00 | 0.88 |
| Q5. Overall satisfaction with current protocols | 3.65 | 4.00 | 1.00 |

Table (1) shows the descriptive statistics of the research sample consisting of (200) individuals, where the results showed that the average responses of the sample members were relatively high, as the fourth item related to the contribution of protocols to speeding up the response time obtained the highest arithmetic mean (4.10), followed by the third item related to improving communication between paramedics and informants (3.95), while the lowest mean was for the fifth item related to general satisfaction with the protocols (3.65). These results indicate that sample members recognize the importance of reporting protocols in enhancing work efficiency and response time, while there is a need for further development to enhance overall satisfaction with them.

**Table (2): Independent Samples T-Test by Gender**

| Variable | Group | N | Mean | Std. Deviation | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|
| Response Time Efficiency | Male | 120 | 3.90 | 0.95 | 2.10 | 198 | 0.036 |
| | Female | 80 | 3.60 | 0.98 | | | |

The T-Test table shows that there are statistically significant differences between the responses of males and females with regard to response time efficiency, as the arithmetic mean for males was (3.90) compared to (3.60) for females, with a value of (t = 2.10) and statistical significance (Sig = 0.036). This finding suggests that males rate response time efficiency higher than females, which may reflect differences in experience or level of engagement with triage protocols.

**Table (3): One-Way ANOVA by Age Group**

| Source of Variation | Sum of Squares | df | Mean Square | F | Sig. (p) |
|---|---|---|---|---|---|
| Between Groups (Age) | 2.85 | 2 | 1.425 | 4.12 | 0.018 |
| Within Groups | 67.80 | 197 | 0.344 | | |
| Total | 70.65 | 199 | | | |

The ANOVA table shows that there are statistically significant differences between age groups in evaluating the effectiveness of the notification screening protocols, as the value (F = 4.12) reached a significance level of (Sig = 0.018), which is less than (0.05). This finding suggests that age plays an influential role in how individuals perceive the effectiveness of protocols and their impact on response time, which calls for consideration of age differences when developing training and rehabilitation programs.

**Results after analysis**

The Saudi Red Crescent Authority's emergency medical call centers face a range of complex challenges that directly impact their efficiency and ability to manage reports effectively. These challenges are evident in the tense and dynamic nature of the work, which requires precision and speed in decision-making. One of the most important of these challenges is the enormous work pressure during peak times or major incidents, as the centers receive a large number of calls simultaneously, placing significant psychological and professional pressure on the response staff. This pressure can lead to slow response times or even errors in the process of sorting reports, which negatively impacts response time. Another important challenge is .the quality of the information received Often, callers are in a state of panic or confusion, making them unable to provide accurate and clear information about the accident location or the condition of the injured person. This ambiguity of information requires high skills from the call center employee to extract vital details in a short time and may lead to the ambulance team being sent to the wrong location or sending the wrong team for the case. Non-emergency and spam calls are also an ongoing challenge. Calls that are not

.related to emergencies consume valuable time and resources that could be used to respond to real reports Handling these calls requires employees to be skilled at distinguishing between serious and non-serious .calls while maintaining a high level of professionalism

Keeping pace with technological developments also poses a challenge. Communication systems and .reporting management programs require continuous updating and maintenance to ensure their efficiency Providing adequate training for employees on how to use these systems is crucial to ensuring maximum benefit. Therefore, managing these challenges is an essential part of contact centers' work. This requires developing and designing integrated strategies that include employee training, developing protocols, and .utilizing advanced technology to ensure they are able to perform their vital life-saving tasks

**Main findings from the study**

The main findings of the study confirm a direct and strong relationship between the quality of these protocols and the efficiency of operational performance. This analysis shows that the effectiveness of protocols is the cornerstone of achieving the shortest possible response time, which is the primary goal of .any emergency service

.The study shows that accurate screening is the most influential factor in accelerating response  The clearer and more specific the protocols, the better the communications staff will be able to correctly and quickly triage cases, ensuring the dispatch of appropriate resources—such as a fully equipped ambulance, a specialized medical team, etc.—in the shortest possible time. Conversely, inaccurate triage can delay the .dispatch of assistance or send the wrong team, putting the lives of injured people at risk

.The results also highlight the importance of developing the human element  No matter how sophisticated protocols are, they ultimately depend on the employee's skill in implementing them. Therefore, the study suggests that ongoing, specialized training for call center employees, particularly in dealing with difficult situations, under pressure, and extracting vital information from confused callers, is a vital component in .enhancing triage effectiveness and, consequently, improving response time

The results indicate that advanced technology plays a significant role in supporting this process. The study ,demonstrates that automated sorting systemsGPS systems,  and modern communication methods can significantly reduce coordination time and resource allocation. This integration of clear protocols and .modern technology creates a comprehensive and effective response system

Therefore, it can be demonstrated that improving triage protocols leads to a better allocation of limited resources. Through accurate triage, resources can be avoided from being wasted on non-emergency cases and instead directed to cases requiring urgent intervention, thus increasing the overall efficiency of the system. All the results confirm that investing in developing and updating triage protocols is not merely an administrative measure, but rather a direct investment in the quality of health services provided and in .saving lives

**Recommendations for improving screening protocols and response time**

To improve the reporting protocols and reduce response times at the Saudi Red Crescent Authority's call centers, a set of recommendations can be presented that focus on human and technical aspects. These can :be explained as follows

**Recommendations for the human factor-**

Call center employees should undergo regular training programs that focus on realistic emergency scenarios, how to handle stressful situations, and how to quickly extract essential information from .confused callers

Staff must be trained in effective listening and clear communication skills to ensure that the nature of the condition is understood and that initial medical advice is provided correctly and quickly.

Establish a system to evaluate the performance of triage staff based on the speed and accuracy of their classification of reports, providing incentives for excellence and identifying weaknesses that need improvement.

## Recommendations on the technical aspect

Promoting digital transformation in triage operations

Investment should be made in integrating artificial intelligence and machine learning algorithms into reporting systems, enabling these systems to analyze data instantly and predict the severity of the case before human intervention. This approach contributes to accelerating the decision-making process and reducing response time, ensuring optimal handling of critical situations.

Using Voice Analysis for Early Detection of Critical Cases

The study recommends developing advanced technologies capable of analyzing the voice tone of the caller, allowing for the detection of signs of stress or distress that may reflect the seriousness of the situation. This system will add an additional layer of accuracy to triage protocols and enhance teams' ability to intervene quickly and effectively.

Integration with Global Positioning Systems (GIS)

The study recommends linking triage protocols directly with ambulance GPS systems, enabling the nearest team to be directed to the reported location in real-time. This ensures reduced access time and increased efficiency in the distribution of field resources, especially in situations requiring urgent intervention.

Integration with health systems and hospitals

It is important to activate electronic connectivity between reporting centers and receiving hospitals, so that the patient's data is automatically transmitted before arrival. This will help prepare medical staff and appropriate equipment in advance, improving the quality of care provided and increasing the chances of saving lives

Customizing triage protocols based on specific regions

Specialized triage protocols should be designed to address the most common reports in each geographic area, such as traffic accidents in major cities or drowning incidents in coastal areas. This allocation contributes to increasing the efficiency of the response and ensuring that procedures are tailored to local challenges.

Using Predictive Artificial Intelligence in Resource Allocation

The study recommends adopting predictive systems based on historical data analysis to monitor peak areas and critical times. Based on these forecasts, ambulances and medical resources can be pre-emptively deployed, reducing the likelihood of delays when accidents occur in those areas.

Involving beneficiaries in improving service quality

It is suggested to implement electronic applications that enable informants to add photos or videos illustrating the case, which would facilitate the triage process and increase its accuracy. It is also recommended to establish mechanisms for receiving feedback from citizens regarding the speed of response and quality of service, with the aim of developing realistic performance indicators that contribute to improving protocols.

Conduct periodic simulations

To ensure triage systems are prepared to handle an increase in the number of reports or major disasters, it is recommended to conduct periodic virtual simulations. These experiments help evaluate the effectiveness of current protocols, identify vulnerabilities, and develop practical solutions before actual crises occur.

Conducting International Benchmarking

The study recommends conducting comparative studies between the screening protocols adopted by the Saudi Red Crescent Authority and those implemented in leading countries such as Canada and the United Kingdom. This will help extract global best practices and adapt them to the local context in the Kingdom

Enhancing Future Research and Continuous Innovation

The study emphasizes the importance of supporting future scientific research in the field of screening protocols by encouraging universities and research centers to study the impact of emerging technologies. It is also recommended to establish specialized innovation laboratories to develop new, practically applicable solutions, ensuring sustainable development and keeping pace with technological changes and societal needs.

## Conclusion

The study confirms that the effectiveness of the triage protocols in the Saudi Red Crescent Authority's call centers is a significant and direct factor in determining the efficiency of response time and the quality of ,emergency services provided. The analysis demonstrated that the presence of clear and unified protocols supported by continuous training of human resources and the use of modern technologies, directly leads to improving the Authority's ability to prioritize cases and allocate resources optimally, thus reducing the time required for assistance to reach the injured. Investing in these aspects is not merely an administrative measure, but rather an investment in saving lives and enhancing community confidence in the emergency .system

Based on the findings and recommendations, a roadmap for the future can be developed to elevate emergency services to the highest international standards. This can be achieved by developing artificial intelligence systems capable of instantly analyzing voice and text reports and accurately classifying them based on massive databases. This reduces triage time and enhances decision-making accuracy. These ,systems can also provide immediate recommendations to first responders based on reported symptoms accelerating the process of providing initial medical advice. Furthermore, the skills of call center employees can be enhanced and virtual reality technologies can be leveraged to create training environments that simulate real-life emergency scenarios. This enables employees to practice handling stressful situations and making quick and accurate decisions in a safe, realistic environment, thus improving their actual .performance

The Saudi Red Crescent Authority must leverage the massive data collected from daily reports Analyzing this data can identify temporal and spatial patterns of emergencies and predict their occurrence, enabling the Authority to proactively and effectively allocate resources, such as redeploying ambulances to areas expected to experience high demand for services. As new types of emergencies emerge and medical procedures evolve, a mechanism must be in place to ensure protocols are continuously updated. A specialized committee can be established, comprising experts in emergency medicine and crisis management, tasked with reviewing and developing protocols to ensure they are aligned with global best practices

Through this, the future of ambulance services in the Kingdom of Saudi Arabia offers a great opportunity for innovation and continuous improvement. Embracing these future prospects will enhance the role of the

Saudi Red Crescent Authority as a leading emergency response entity and achieve its goal of saving lives and serving the community efficiently and effectively.

## References

1. Li, T., Haines, J. K., De Eguino, M. F. R., Hong, J. I., & Nichols, J. (2023). Alert now or never: Understanding and predicting notification preferences of smartphone users. ACM Transactions on Computer-Human Interaction, 29(5), 1-33.

2. Pérez-Pérez, B. D., Garcia Vazquez, J. P., & Salomón-Torres, R. (2021). Evaluation of convolutional neural networks' hyperparameters with transfer learning to determine sorting of ripe medjool dates. Agriculture, 11(2), 115.

3. Wilts, H., Garcia, B. R., Garlito, R. G., Gómez, L. S., & Prieto, E. G. (2021). Artificial intelligence in the sorting of municipal waste as an enabler of the circular economy. Resources, 10(4), 28.

4. Pinto, S. B., Riback, T. I., Sylvestre, G., Costa, G., Peixoto, J., Dias, F. B., ... & Moreira, L. A. (2021). Effectiveness of Wolbachia-infected mosquito deployments in reducing the incidence of dengue and other Aedes-borne diseases in Niterói, Brazil: A quasi-experimental study. PLoS neglected tropical diseases, 15(7), e0009556.

5. Marques, B., Silva, S., Rocha, A., Dias, P., & Santos, B. S. (2021, March). Remote asynchronous collaboration in maintenance scenarios using augmented reality and annotations. In 2021 IEEE Conference on Virtual Reality and 3D User Interfaces Abstracts and Workshops (VRW) (pp. 567-568). IEEE.

6. Wood, A. J. (2021). Algorithmic management consequences for work organisation and working conditions (No. 2021/07). JRC working papers series on labour, education and technology.

7. Katsaros, K. K., Tsirikas, A. N., & Kosta, G. C. (2020). The impact of leadership on firm financial performance: the mediating role of employees' readiness to change. Leadership & Organization Development Journal, 41(3), 333-347.

8. Koronen, C., Åhman, M., & Nilsson, L. J. (2020). Data centres in future European energy systems—energy efficiency, integration and policy. Energy efficiency, 13(1), 129-144.

9. Aburayya, A., Marzouqi, A., Alawadhi, D., Abdouli, F., & Taryam, M. (2020). An empirical investigation of the effect of employees' customer orientation on customer loyalty through the mediating role of customer satisfaction and service quality. Management Science Letters, 10(10), 2147-2158.

10. Balduzzi, A., Brivio, E., Rovelli, A., Rizzari, C., Gasperini, S., Melzi, M. L., ... & Biondi, A. (2020). Lessons after the early management of the COVID-19 outbreak in a pediatric transplant and hemato-oncology center embedded within a COVID-19 dedicated hospital in Lombardia, Italy. Estote parati. Bone Marrow Transplantation, 55(10), 1900-1905.

11. Chatterjee, S., Chaudhuri, R., Vrontis, D., Thrassou, A., & Ghosh, S. K. (2021). ICT-enabled CRM system adoption: a dual Indian qualitative case study and conceptual framework development. Journal of Asia Business Studies, 15(2), 257-277.

12. Goniewicz, K., Khorram-Manesh, A., Hertelendy, A. J., Goniewicz, M., Naylor, K., & Burkle Jr, F. M. (2020). Current response and management decisions of the European Union to the COVID-19 outbreak: a review. Sustainability, 12(9), 3838.

13. Montero-Tejero, D. J., Jiménez-Picón, N., Gómez-Salgado, J., Vidal-Tejero, E., & Fagundo-Rivera, J. (2024). Factors influencing occupational stress perceived by emergency nurses during prehospital care: a systematic review. Psychology research and behavior management, 501-528.

14. Li, T., Koloden, D., Berkowitz, J., Luo, D., Luan, H., Gilley, C., ... & Barbara, P. (2024). Variability of Prehospital Pain Management Protocols: A Review of Prehospital Care Protocols in the United States. Open Access Emergency Medicine, 337-345.

15. Schick, B., Mayer, B., Jungwirth, B., Barth, E., Muth, C. M., Eimer, C., ... & Schönfeldt-Lecuona, C. (2024). Does the gender of emergency physicians have an impact on the prehospital care of psychiatric emergencies? a retrospective cohort analysis. BMC Emergency Medicine, 24(1), 201.