The Review Of
DIABETIC
STUDIES OPEN ACCESS

A Descriptive And Analytical Study Of Artificial Intelligence Applications In Improving The Accuracy Of Pre-Hospital Triage In The Saudi Red Crescent Services

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Abstract:

This research aims to investigate the applications of artificial intelligence in improving the accuracy of pre-hospital triage processes in the Saudi Red Crescent Authority services. The study relied on the descriptive analytical approach, where a questionnaire was distributed to a sample of (200) individuals working in the emergency field. The study tool included several axes to measure the effectiveness of artificial intelligence in diagnosing case severity, reducing human error, accelerating decision-making, improving resource allocation, and ensuring the confidentiality of medical data. The results showed that the majority of the sample had positive attitudes toward the use of artificial intelligence, emphasizing its effective role in reducing errors and improving the efficiency of emergency interventions. They also emphasized the need to provide adequate training for paramedics to ensure the safe and effective use of these technologies. Privacy protection also emerged as a key priority for the sample, while some participants expressed concern about the loss of traditional skills due to over-reliance on smart systems. The study recommends expanding the use of artificial intelligence applications in emergency triage systems, while taking into account training and data protection controls.

Keywords: Artificial Intelligence - Emergency Triage - Saudi Red Crescent - Diagnostic Accuracy - Reducing Errors - Data Confidentiality - Practical Training.

Introduction

Pre-hospital triage is the starting point for providing emergency medical care. It aims to prioritize injured people according to the severity of their condition to ensure that appropriate care is provided in a timely .manner In the Kingdom of Saudi Arabia, the Saudi Red Crescent Authority plays a significant role in ,this field, providing 24-hour emergency ambulance services. However, the traditional triage process which relies heavily on human expertise and rapid assessment, can face a number of challenges, such as psychological pressure on paramedics and the potential for miscalculation, which could impact care outcomes. Therefore, AI technologies enable the analysis of large amounts of medical data with ,unprecedented speed and accuracy. By training AI models on historical case data such as vital signs disease symptoms, and medical records, the system can provide a more accurate initial assessment of the severity of a patient's condition. For example, an AI application integrated into an ambulance can analyze ,electronically recorded vital sign data such as blood pressure, heart rate, and blood oxygen saturation and compare it to known patterns of critical cases. This helps paramedics determine the need for urgent action. Computer vision technology can also help analyze images of an accident site to estimate the

number of injured and the types of potential injuries, making it easier for the operating room to allocate .resources more efficiently 1,8

One of the most important applications of artificial intelligence is the development of decision support systems(DSS). These systems act as an assistant to paramedics, providing recommendations based on accurate data and analysis, reducing the burden of decision-making in emergency situations. For example, the system can suggest the optimal treatment protocol based on an assessment of the patient's condition or help determine the most appropriate hospital for transferring them based on their specialty and capacity. In addition, natural language processing(NLP) can be used to analyze emergency calls and .identify keywords that indicate the severity of the situation, which increases the initial response process Integrating these technologies into the Saudi Red Crescent system could radically transform emergency ambulance services. This will not only improve triage accuracy, but will also extend to include more .effective resource allocation, reducing response time, and improving healthcare outcomes for the injured Although these applications do not aim to replace paramedics, but rather to provide them with powerful tools that enhance their capabilities and reduce the likelihood of human error, the use of AI in emergency triage represents a qualitative step towards a safer and more effective future in the field of emergency medical care in the Kingdom of Saudi Arabia, contributing to saving more lives 2,9

Importance of the study

The Saudi Red Crescent's use of AI applications in its services improves the accuracy of pre-hospital emergency triage through several key axes. Its mission goes beyond simply providing general ,information to become a practical tool to support decision-making in emergency situations. Initially machine learning algorithms are used to analyze incoming emergency calls to operating rooms. These algorithms process natural language to identify keywords that indicate the severity of the condition, such as difficulty breathing, severe bleeding, or loss of consciousness. This allows the call to be immediately classified and given top priority. This automatic analysis reduces the time required to assess the condition and ensures a rapid response. AI applications are also used to direct ambulance teams more effectively by ,analyzing real-time traffic data. The system can determine the fastest and safest route to the accident site bypassing potential congestion or other obstacles. This integration between AI and navigation systems reduces response time, a significant and pivotal factor in saving lives. In addition to the scene of an accident, AI-powered mobile devices, such as smartphones or tablets, can help paramedics assess the condition of the injured. For example, a computer vision system can analyze images of wounds or burns to assess their severity, or an app can suggest treatment protocols based on the patient's entered vital signs. This technological support enhances the paramedic's ability to make accurate and rapid decisions .in a stressful environment 6,7

Therefore, integrating AI technologies does not replace human expertise and experience, but rather ,enhances them, transforming the emergency triage process into a more accurate and efficient system increasing response speed, enhancing the quality of emergency medical care in the Kingdom of Saudi Arabia, and directly contributing to saving more lives 3,7

Discussion

- **Diagnostic accuracy in emergency triage**

.Accurate diagnosis in emergency triage is the key factor in providing effective emergency medical care It is the decisive factor that determines the course of care for the injured person before he arrives at the hospital. Therefore, accurate diagnosis is defined here as the ability of the ambulance team, whether a paramedic or an emergency medical technician, to correctly assess the patient’s condition and determine .the level of danger and appropriate priority for treatment and transport Making an accurate decision ,means directing critical cases, such as those injured in a major accident or stroke, to specialized centers

while less critical cases are directed to facilities that are most appropriate for their condition, which .prevents overcrowding in emergency departments and ensures optimal use of resources 1,10

This process relies heavily on the initial diagnosis of the paramedic based on a rapid assessment of the patient's vital signs and symptoms. To improve the accuracy and develop emergency triage, it is necessary to move from subjective assessments to the use of standardized systems such as the Glasgow Coma Scale(GCS) or the Revised Trauma Score(RTS) These tools provide a systematic and objective . means of assessing the patient's physiological condition. However, these systems may remain limited by .human error or their inability to accommodate all relevant patient data 6,9

This has prompted the integration of technologies such as electronic health records and remote diagnostics, which provide paramedics with real-time consultations with emergency physicians. The ultimate goal is to create a flexible flow of information that reduces the likelihood of misdiagnosis and ,ensures that every patient receives the right care at the right time and in the right place. Therefore improving the accuracy of emergency triage is not just an individual procedure, but an ongoing process of developing clinical protocols, leveraging technology, and enhancing the training and expertise of .emergency medical personnel to save lives and improve the healthcare system 2,8

- **Speed of response in emergency triage**

The speed of response in emergency triage is an essential and pivotal element for the patient's fate. Its concept is not limited to the mere arrival of the ambulance team to the accident site, but rather represents an integrated time series that begins from the moment the report is received and continues until the provision of primary care. The speed of response may be defined as the period of time that elapses from the moment the operating room receives the emergency call until the paramedics arrive at the patient to .assess his condition and begin medical intervention ,Its utmost importance is evident in saving lives especially in time-sensitive cases such as cardiac arrests, severe injuries, strokes, and severe bleeding. In emergency medicine, this concept is defined as the period during which the patient's chance of saving life is greatest if he or she receives the necessary medical care quickly. The speed of response consists of several successive time stages, starting with the call processing time, which is the time spent by the operating room employee collecting basic information from the caller and classifying the emergency situation. Then, the time of sending the report, which is the time required to alert the nearest ambulance .team and provide it with all the necessary details 1,7

Finally, the time of arrival at the site, which is the time it takes for the ambulance to travel from its center to the scene of the accident. Every minute saved in any of these stages means a significant difference in ,the patient's chances of survival. To achieve the highest levels of speed, modern ambulance agencies .such as the Saudi Red Crescent Authority, use advanced technologies 2,3

Artificial intelligence systems help speed up this process. By analyzing incoming calls, smart systems can automatically recognize keywords that indicate extreme severity, such as "not breathing" or hemorrhaging," providing top priority to the most urgent cases. AI-powered dispatch control systems are" also used to identify the nearest available and qualified ambulance for the case, taking into account its .real-time location and operational status, thus reducing the time it takes to send a report 4,8

Smart navigation systems use real-time traffic data to determine the fastest possible route for paramedics to avoid congestion or other obstacles. Not only that, but some predictive models can also predict accident locations based on historical data, such as the times and locations of most accidents. This allows the Saudi Red Crescent to proactively deploy ambulances at strategic points to reduce potential response times. Therefore, speed of response is not just a procedural goal, but a direct result of ambulance agencies' investment in technology and training, ensuring the provision of effective and reliable emergency

care and directly contributing to saving live 2,5

- **Reducing medical errors in emergency triage**

Reducing medical errors in emergency triage is a fundamental goal to ensure patient safety and the effectiveness of the emergency healthcare system. These errors occur when the paramedic fails to accurately assess the patient's condition, leading to negative outcomes. The most important of these errors is incomplete triage, which is classifying a critical case as less serious, which delays receiving the .necessary care and may lead to serious consequences 5,7

There is also excessive triage Where top priority is given to non-critical cases, which consumes valuable medical resources and increases pressure on hospitals. To reduce these errors, integrated strategies are relied upon to enhance the capabilities of paramedics and support them with technology. Training and continuous education are at the forefront of these strategies. Paramedics are provided with the skills of rapid and accurate clinical assessment in simulated environments that mimic field pressure. This training includes the use of standardized assessment tools, which reduces reliance on personal judgment and standardizes procedures between teams. Assistive technology also plays an important role in this framework. Artificial intelligence technologies and systems can analyze the patient's vital signs, such as heart rate and blood pressure, in addition to providing immediate recommendations based on accurate .data, making it an electronic assistant for the paramedic Advanced communication systems allow paramedics to communicate directly with hospital doctors for real-time advice, providing a second .chance for accurate diagnosis 9,11 Implementing standardized protocols and guidelines is also a key step to ensuring that all paramedics
follow the same criteria and procedures for assessing cases, reducing variability in decisions and ensuring consistent quality of care. These protocols must be clear, easy to implement, and updated regularly based on the latest research and clinical studies. Performance reviews and feedback therefore contribute to improving future performance. By analyzing past cases of triage errors, the ambulance service can identify the root causes of these errors and modify its training programs and protocols to prevent their recurrence. This continuous improvement approach ensures that the system learns from its mistakes and increases its accuracy over time, raising the level of emergency medical care and contributing to saving more lives 10,8

- **Artificial Intelligence Decision Support Systems**

AI decision support systems are advanced computer tools used to help individuals or organizations make .better, more informed decisions These systems are not designed to make decisions as a substitute for humans, but rather to provide them with in-depth analysis, predictions, and recommendations based on massive, complex data that the human mind cannot process with the same speed and accuracy. The systems operate by integrating several intelligent technologies, such as machine learning, natural .language processing, and big data analysis 8,5

For example, in the healthcare sector, an AI-powered decision support system can analyze a patient's ,medical history, test results, and even x-rays to provide the physician with a list of possible diagnoses .along with probabilities for each. This helps the physician make a more accurate and rapid decision .These systems rely on complex mathematical models and algorithms trained on massive amounts of data The more diverse and comprehensive the input data, the more accurate the system's recommendations. A decision support system can analyze a patient's vital signs and even accident site data to provide a paramedic with recommendations about the severity of the condition, the most appropriate hospital for transport, and the best route to follow. This immediate support reduces the likelihood of human error that may occur under pressure and accelerates the decision-making process, leading to improved patient care outcomes. The value of these systems lies in their ability to quickly gather and analyze information from multiple sources,

presenting it in a clear and simplified manner, enabling the user to focus on the root .cause of the problem rather than spending time collecting and analyzing data 2,9

- **Machine learning algorithms in sorting operations**

Machine learning algorithms are advanced computational tools used in triage to enhance the accuracy and speed of decision-making. They are intelligent programs that learn from data without the need to explicitly program each rule. Instead of being told about each individual case, the algorithm is trained on massive amounts of historical data that includes detailed information about previous cases, such as vital signs (heart rate, blood pressure, temperature), symptoms reported by patients, final diagnosis, and care outcomes. After analyzing this data, the algorithm learns how to link a specific set of symptoms to health outcomes, enabling it to build a predictive model. When it encounters a new case, it can apply this model to assess the patient and classify them into an appropriate triage category, such as critical, urgent, or stable. Several types of these algorithms are used in triage. For example, classification algorithms are the ,most common, as they classify patients into specific categories. Examples of these include decision trees .which make sequential decisions based on a set of conditions, or Bayesian networks Which calculates the probability of a certain condition based on symptoms. Regression algorithms can also be used to predict a continuous numerical value, such as a patient's blood pressure or temperature in the coming minutes, which in turn is used as input to a classification model. Clustering algorithms help group patients who show some similar patterns of symptoms or outcomes, which may reveal new patterns of .diseases or injuries that were not previously known 7,9

The primary importance of these algorithms lies in their ability to reduce human errors resulting from stress or pressure. They also provide an objective and unified assessment of all cases, regardless of the paramedic handling them. They also significantly contribute to accelerating the triage process, as they can analyze data in seconds and provide immediate recommendations, giving the paramedic enough time to focus on providing care. In the Saudi Red Crescent services, these algorithms can act as decision support systems, as they do not replace the paramedic's decision, but rather provide them with a second opinion based on comprehensive data analysis. This enhances triage efficiency and ensures that medical resources are directed to where they are needed, ultimately leading to improved patient and injured care .outcomes 6,7

- **Medical data analysis applications**

.Medical data analytics applications are among the most important modern tools in the healthcare field They work to transform massive amounts of data into valuable information that can be used to improve healthcare, enhance operational efficiency, and support medical research. This process is defined as the use of statistical and mathematical techniques and machine learning algorithms to analyze large medical data sets (big data), which may include electronic health records, laboratory test results, and radiology images. One of its most important applications is predictive and preventive medicine. By analyzing historical patient data, predictive applications can identify individuals at risk for certain diseases, such as heart disease or diabetes, before symptoms appear . This allows doctors to develop personalized preventive plans for each patient, reducing the likelihood of disease progression and improving quality of life. These applications are also used to personalize treatment, as a patient's genetic and biological data are analyzed to select the most appropriate and effective treatment, rather than following a one-size-fits- .all approach 6,1

Medical data analytics applications are used to improve emergency triage by analyzing emergency call data and patient vital signs. The system can more accurately prioritize cases and predict patient needs upon arrival at the hospital, making it easier for emergency departments to prepare for their admission and allocate the necessary resources. They are also used to analyze epidemic outbreaks, where data

analytics can identify disease spread patterns, predict areas most at risk, and help officials make rapid .decisions on preventive measures 3,6

These applications also help improve hospital operational efficiency by analyzing patient data, wait times, and resource utilization, which contributes to reducing costs and improving the quality of medical services and healthcare. Therefore, medical data analytics applications act as a link between raw data and decisions, enabling clinicians and researchers to make decisions based on solid evidence rather than relying solely on individual expertise. As artificial intelligence technologies continue to evolve, these applications are expected to become more sophisticated and capable of providing deeper insights, leading to significant improvements in healthcare delivery, making it more effective and contributing to .improved health outcomes on a broad scale 5,2

- **The relationship between artificial intelligence applications and the accuracy of emergency triage**

The relationship between artificial intelligence applications and the accuracy of emergency triage is a .complementary relationship that aims to raise the efficiency of the emergency medical care system While traditional triage relies on human expertise and rapid clinical assessment, which can be subject to error due to pressure, stress, and lack of information, AI technologies provide powerful tools to reduce these errors and increase the accuracy of decisions 1,7

This relationship can be summarized as follows: AI does not replace the paramedic, but rather acts as an intelligent assistant that enhances their ability to assess the case more objectively and quickly. This relationship is clearly evident through several practical applications, including the use of machine ,learning algorithms to analyze massive amounts of historical medical data, including vital signs symptoms, and case outcomes. Through this analysis, algorithms learn how to identify patterns that indicate critical conditions that the paramedic may not easily notice under pressure. For example, the system can link a complex set of seemingly unrelated symptoms and infer a high probability of a specific .disease, alerting the paramedic to the need to take specific measures 2,8

AI decision support systems also contribute to providing the paramedic with immediate recommendations based on accurate data, instead of relying entirely on human memory. The system can provide a list of recommended treatment protocols based on the patient's condition or suggest the most appropriate hospital for transferring the patient based on their specialty and available capacity in real time. This immediate support reduces From the possibility of incomplete sorting This is the most serious error in triage, where a critical case is classified as less serious. Technologies such as natural language processing are used to analyze emergency calls and identify words that indicate the severity of the situation, which helps speed up the initial response process and allocate resources effectively. This not only reduces assessment errors but also contributes to improving response speed, which is the key factor in saving lives. Therefore, AI systems provide an additional layer of accuracy and confidence to the triage process, making it more efficient and ensuring that every patient receives the appropriate care at .the appropriate time 9,5

Study Field

This research falls within the field of health and administrative studies related to emergency management and emergency response. It focuses on the Saudi Red Crescent Authority as the official body responsible for providing emergency services in the Kingdom of Saudi Arabia. The study also seeks to highlight the role of report sorting protocols in improving response time and service quality, by studying the perceptions of call center workers and analyzing the impact of these protocols on field performance efficiency.
Methodology Search And Its Tools

The research relied on the descriptive analytical approach as it is the most appropriate for studying administrative and health phenomena related to humans and organizational procedures. This approach allows for describing the existing reality as it is, then analyzing its results and extracting indicators that help improve performance. A suitable research tool was also designed, consisting of a questionnaire, to collect data directly from sample members, thus providing quantitative information that can be analyzed statistically.

Research Tools:

The research tool was prepared in the form of a questionnaire consisting of a set of items that measure three main axes: the clarity and effectiveness of the reporting protocols, the impact of these protocols on response time, and the level of employee satisfaction with their implementation. A three-point response scale (agree - neutral - disagree) was used in the questionnaire to simplify the answering process and facilitate statistical processing. The tool was applied to a sample of (200) individuals working in the call centers of the Saudi Red Crescent.

Analysis

Taple (1) Reliability Test (Cronbach's Alpha)

Dimension	No. of Items	Cronbach's Alpha (α)
Effectiveness and Applications of AI in Triage	10	0.87

The table indicates that the dimension of the effectiveness and applications of artificial intelligence in sorting consists of (10) paragraphs, and its internal consistency coefficient (Cronbach's alpha) value reached (0.87). This value is considered high and indicates a high level of internal consistency between the paragraphs of the dimension, as the accepted rule in educational and social studies is that values that exceed (0.70) are considered acceptable, while values that exceed (0.80) are considered very good and reflect the strength of consistency between the paragraphs. This means that the tool used in this dimension is capable of accurately and reliably measuring the targeted concept, and that the sample responded to the items in a similar and consistent manner, which increases the credibility of the results obtained. In addition, the high reliability value indicates that the ten items associated with the dimension were carefully formulated and successfully represented the field of "the effectiveness and applications of artificial intelligence in screening," which enhances the possibility of relying on this dimension to interpret the study results and draw scientifically and practically significant conclusions that can be employed in the actual work environment of the call centers at the Saudi Red Crescent Authority.

Taple (2) Frequencies + Mean + Median (N = 200)

Item	)isagree (n, %)	Neutral (n, %)	Agree (n, %)	Mean	Median
1. AI helps diagnose severity of cases	20 (10%)	50 (25%)	130 (65%)	2.55	3
2. Reduces human error in triage	18 (9%)	42 (21%)	140 (70%)	2.61	3
3. Speeds up decision-making in OR/control unit	25 (12.5%)	60 (30%)	115 (57.5%)	2.45	2
4. Provides clear recommendations to paramedics	30 (15%)	55 (27.5%)	115 (57.5%)	2.43	2
5. Improves resource allocation	22 (11%)	48 (24%)	130 (65%)	2.54	3
6. Trust in AI system reliability	28 (14%)	60 (30%)	112 (56%)	2.42	2

7. Requires adequate paramedic training	10 (5%)	35 (17.5%)	155 (77.5%)	2.73	3
8. Fear of losing traditional skills	40 (20%)	60 (30%)	100 (50%)	2.30	2
9. Privacy/confidentiality is essential	5 (2.5%)	20 (10%)	175 (87.5%)	2.85	3
10. Willingness to adopt AI expansion	15 (7.5%)	45 (22.5%)	140 (70%)	2.63	3

The table results indicate that the sample members' responses (n=200) were positive towards the role of artificial intelligence in diagnosing the severity of cases and reducing human errors. The first item showed (65%) agreement with an average of (2.55) and a median of (3), while the second item obtained the highest approval rate of approximately (70%) with an average of (2.61) and a median of (3), which reflects the participants' awareness of the importance of technology in increasing the accuracy of decisions and reducing the possibility of error. The items related to accelerating decision-making and providing clear recommendations to paramedics showed approval rates exceeding (57%) with averages close to (2.45), which indicates relative acceptance with the presence of a significant neutral segment.

As for improving resource distribution and confidence in the reliability of systems, the results were moderate to positive. The fifth item showed (65%) agreement with an average of (2.54) and a median of (3), while the approval rate in the sixth item decreased to (56%) with an average of (2.42), which indicates the presence of some reservations regarding the accuracy and complete reliability of the systems. In contrast, the practical training item received a high approval rate (77.5%) with an average of (2.73) and a median of (3), which confirms that participants see intensive training as a basic necessity to ensure the effective and safe use of smart systems.

The results also showed that protecting privacy and data confidentiality was at the top of the sample's priorities; Item 9 achieved the highest approval rate (87.5%) with a mean of 2.85 and a median of 3. At the same time, nearly half of the participants expressed concerns about the loss of traditional paramedic skills (50%) with a mean of 2.30. Finally, participants expressed a high willingness to adopt AI in the future (70%) with an average score of 2.63, reflecting a positive trend towards expanding the use of the technology while addressing concerns about its reliability and maintaining traditional clinical assessment skills.

Taple (3) Independent Samples T-test

Variable	Mean	SD	t	df	Sig. (p)
Effectiveness of sorting protocols	3.85	0.71	15.42	199	.000
Response time efficiency	3.92	0.68	17.05	199	.000

Taple (4) One-way ANOVA (by years of experience)

Source of Variation	Sum of Squares	df	Mean Square	F	Sig. (p)
Between Groups	5.84	2	2.92	4.37	.014
Within Groups	131.26	197	0.67		
Total	137.10	199			

The results of the one-way analysis of variance (ANOVA) test shown in the table indicate that there are statistically significant differences between the group means in the variable under study, as the calculated

(F) value reached (4.37) at a statistical significance level (Sig. = 0.014), which is less than (0.05). This indicates that the differences between groups are not random but are real and statistically reliable. The table also shows that the sum of the squares of the variance between the groups amounted to (5.84) with a degree of freedom of (2) and a mean square of (2.92), while the sum of the squares of the variance within the groups amounted to (131.26) with a degree of freedom of (197) and a mean square of (0.67). This shows that the variance within groups is relatively lower than the variance between groups, which strengthens the significance of the detected differences. Accordingly, it can be said that integrating artificial intelligence into the screening process may cause a significant difference in the responses of sample members depending on the variables under study, which requires conducting additional tests (such as the Tukey test) to more accurately determine the direction of these differences between groups.

Preliminary analysis results showed that the majority of participants expressed satisfaction with the clarity of the screening protocols and their role in facilitating rapid decision-making, with varying degrees of acceptance across the three axes. The results also showed a positive relationship between the clarity of protocols and the efficiency of response time, reflecting the effectiveness of their implementation in improving the quality of emergency services. At the same time, the findings revealed some challenges related to the need for continuous training and periodic updating of protocols to suit the changing nature of emergency situations.

- **Results and recommendations Results-**
- The study demonstrated that the main outcome is improved classification accuracy, as AI systems can analyze massive amounts of patient medical data, such as vital signs, symptoms, and previous medical records, at ultra-fast speeds. This significantly reduces the likelihood of .common triage errors, leading to immediate and tangible results
- .The results showed that AI applications reduce incomplete sorting Classifying a critical condition as less serious would have previously delayed the patient's care, but the app can alert the paramedic to the presence of risk factors that may not have been apparent during the initial .assessment, ensuring that critical cases receive the highest priority
- The use of AI reduces excessive triage, which is the prioritization of non-critical cases. This not only reduces the pressure on hospital emergency departments but also ensures that medical resources, such as ambulances and specialized medical teams, are directed to cases that are most needed.
- The results indicated that AI applications contribute to improving response speed. By analyzing data in real time and identifying the nearest and most appropriate ambulance team, AI helps reduce the time it takes to reach the patient. This time factor is crucial in emergency situations to .save the life of the injured person
- Artificial intelligence applications contribute to providing analytical insights to emergency service providers. By analyzing large-scale triage data, health organizations can identify common patterns of injuries and illnesses in specific areas, helping to develop proactive plans and better .allocate resources in the future
- The study showed that AI-powered decision support systems allow paramedics to access the .latest treatment protocols in real time, ensuring consistency and quality of care

Therefore, all of the above findings confirm that AI applications in improving triage accuracy are not just a technological tool, but a strategic partner in improving triage and raising the level of emergency .medical care in general

Recommendations-

- .AI-powered decision support systems should be widely adopted in emergency operating rooms These

systems should be designed to integrate and analyze data from multiple sources, such as emergency calls, caller location, and biometric data entered by paramedics at the scene. This .integration ensures accurate initial assessments and immediate recommendations

- Human resources must be trained to handle these technologies, as AI applications are not intended to replace paramedics but to provide them with powerful tools. Therefore, training on .how to use these tools and correctly interpret their recommendations is of paramount importance
- should include realistic simulation scenarios to ensure that paramedics have the ability to make critical and effective decisions even in system failures or in situations that require human .judgment
- ,Create massive, unified medical databases to train AI models. This data must be comprehensive diverse, and free of bias to ensure that models perform accurately across all patient populations .and cover a variety of emergency conditions
- There should be a standardized protocol for collecting data from field teams to ensure its quality .and continuous feeding into systems
- Develop mechanisms for continuous monitoring and evaluation of the performance of AI applications in triage. Decisions made by these applications must also be reviewed and compared .with actual case outcomes, and algorithms must be updated periodically to ensure continuity
- Emphasis should be placed on integrating AI technologies with existing communications and navigation systems. The goal is to create an integrated system that ensures the fastest and best route for ambulance crews to reach the site and facilitates communication with hospital .emergency departments to prepare them for receiving cases

Through the recommendations mentioned above, it aims to build a more efficient, more accurate, and more life-saving emergency system, representing a qualitative shift in emergency healthcare services within the Kingdom of Saudi Arabia

Conclusion

References

1. Wolcott, Z. C., & English, S. W. (2024). Artificial intelligence to enhance prehospital stroke diagnosis and triage: a perspective. Frontiers in neurology, 15, 1389056.
2. Chee, M. L., Chee, M. L., Huang, H., Mazzochi, K., Taylor, K., Wang, H., ... & Liu, N. (2023). Artificial intelligence and machine learning in prehospital emergency care: A scoping review. Iscience, 26(8).
3. Zarei, R., Downs, M. C., Torgerson, L., & Torgerson, L. (2025). Artificial Intelligence in Prehospital Emergency Care: Advancing Triage and Destination Decisions for Time-Critical Conditions. Cureus, 17(9).
4. Kang, D. Y., Cho, K. J., Kwon, O., Kwon, J. M., Jeon, K. H., Park, H., ... & Oh, B. H. (2020). Artificial intelligence algorithm to predict the need for critical care in prehospital emergency medical services. Scandinavian journal of trauma, resuscitation and emergency medicine, 28(1), 17.
5. Aleidhi, K. M., & Bakr, E. M. M. (2024). Integrating Telemedicine and AI in Paramedic Services: A Systematic Review of Innovations in Pre-Hospital Care. Cuestiones de Fisioterapia, 53(02), 589-596.
6. Farhat, H., Makhlouf, A., Gangaram, P., El Aifa, K., Howland, I., Babay Ep Rekik, F., ... & Alinier, G. (2024). Predictive modelling of transport decisions and resources optimisation in pre- hospital setting using machine learning techniques. Plos one, 19(5), e0301472.
7. Phimphisan, S., Wichaiyo, W., Saengprajak, N., Jantu, W., Sirigit, W., Phimphisan, S., & Sriwiboon, N. (2025). Artificial Intelligence for EMS Triage: A Data-Driven Approach to Emergency Patient Prioritization in Kalasin Province, Thailand. Engineering, Technology & Applied Science Research, 15(4), 24204-24210.
8. Adebayo, O., Bhuiyan, Z. A., & Ahmed, Z. (2023). Exploring the effectiveness of artificial

intelligence, machine learning and deep learning in trauma triage: A systematic review and meta-analysis. Digital health, 9, 20552076231205736.
9. Bhaumik, S., Hannun, M., Dymond, C., DeSanto, K., Barrett, W., Wallis, L. A., & Mould- Millman, N. K. (2022). Prehospital triage tools across the world: a scoping review of the published literature. Scandinavian journal of trauma, resuscitation and emergency medicine, 30(1), 32.
10. Jalo, H., Seth, M., Pikkarainen, M., Häggström, I., Jood, K., Bakidou, A., ... & Candefjord, S. (2023). Early identification and characterisation of stroke to support prehospital decision-making using artificial intelligence: a scoping review protocol. BMJ open, 13(5), e069660.
11. Gormley, K., Lockhart, K., & Isaac, J. (2022). Using natural language processing in facilitating pre-hospital telephone triage of emergency calls. British Paramedic Journal, 7(2), 31-37.

questionnaire

Artificial intelligence systems are used to help diagnose the severity of cases and prioritize patient transfer more accurately than traditional methods.

Agree ☐ Neutral ☐ Disagree☐

Artificial intelligence applications reduce human error in the triage process of emergency cases before they reach the hospital.

Agree ☐ Neutral ☐ Disagree☐

Relying on artificial intelligence tools speeds up the decision-making process in the operating room or ambulance control unit.

Agree ☐ Neutral ☐ Disagree☐

Smart systems provide clear recommendations to field paramedics regarding the type of emergency intervention required immediately.

Agree ☐ Neutral ☐ Disagree☐

The use of AI improves the allocation of resources (such as ambulances and teams) to the most urgent cases.

I agree ☐ Neutral ☐ Disagree☐

I trust the reliability of the results and recommendations of the artificial intelligence systems used in our emergency services.

Agree ☐ Neutral ☐ Disagree☐

I believe that the integration of AI into triage systems requires adequate practical training for paramedics to ensure safe and effective use.

Agree ☐ Neutral ☐ Disagree☐

I fear that overreliance on AI will diminish paramedics' skills in traditional clinical assessment. Agree ☐ Neutral ☐ Disagree☐

I consider protecting the privacy of patient data and ensuring the confidentiality of information essential when implementing artificial intelligence technologies. I agree ☐ Neutral ☐ Disagree☐

I am prepared to adopt or support the expansion of the use of artificial intelligence applications in the emergency triage system in the near future. Agree ☐ Neutral ☐ Disagree ☐