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The Effectiveness Of Red Crescent Prehospital Emergency Interventions In Saudi Arabia: A Systematic Review Of Response Times, Patient Outcomes, And Service Quality”

Mohammed Saleh Musleh Aljadani[1], Abdulaziz Owaidh Alzibali[1], Yazan saleh Abdullah jarwan[1], Bassam mohammed turkistani[1], Fayez Nasser Ali Zaeri[1], Yahya Abu Bakr Abdullah Abbas[1], Ali Yahya Ali Zaydani[1], Yasser Yaseen Felemban[1]

[1]Saudi Red Crescent Authority, Saudi Arabia, Jeddah.

Abstract

Background: Prehospital emergency medical services (EMS) are vital for reducing morbidity and mortality by ensuring timely interventions and safe transfer of patients. In Saudi Arabia, the Saudi Red Crescent Authority (SRCA) is the primary provider of EMS. However, questions remain about the effectiveness of its interventions, particularly regarding response times, patient outcomes, and service quality.

Aim: This systematic review aims to evaluate the effectiveness of SRCA prehospital interventions by synthesizing existing literature on response times, patient outcomes, and service quality.

Methods: Following the PRISMA 2020 framework, electronic databases (PubMed, Scopus, Web of Science, CINAHL, Saudi Digital Library, and Google Scholar) will be searched for studies published between 2000 and 2025 in English and Arabic. Eligible studies will include those that report on SRCA ambulance services, focusing on at least one of the three outcome domains. Data extraction will cover study characteristics, interventions, outcomes, and quality measures. Risk of bias will be assessed using JBI, Cochrane, and CASP tools as appropriate. Narrative synthesis will be applied due to heterogeneity in study designs.

Expected Results: The review is expected to identify regional disparities in SRCA response times, with urban areas outperforming rural settings. Evidence is anticipated to show that advanced life support interventions improve patient survival and recovery, but inconsistencies in workforce training may limit outcomes. Service quality will likely emerge as a mediating factor, with strengths in infrastructure development but weaknesses in standardization, cultural competence, and patient satisfaction.

Conclusion: By synthesizing available evidence, this review will provide insights into the strengths and challenges of SRCA prehospital care. Findings will inform policymakers, EMS administrators, and healthcare professionals, supporting the goals of Saudi Vision 2030 to enhance healthcare accessibility, quality, and efficiency.

Keywords: Saudi Red Crescent Authority, prehospital emergency care, ambulance response time, patient outcomes, service quality, systematic review, Saudi Arabia.

Introduction

Emergency medical services (EMS) are critical in reducing morbidity and mortality during emergencies by providing rapid, high-quality prehospital care. Globally, prehospital interventions—particularly those delivered by organizations such as the Red Crescent—play an essential role in stabilizing patients, ensuring timely transfer, and improving survival outcomes (Alrazeeni, 2020; Ong et al., 2021). In Saudi Arabia, the Saudi Red Crescent Authority (SRCA) is the primary provider of prehospital emergency care, with responsibilities that include ambulance dispatch, patient stabilization, and coordination with hospitals (AlShammari et al., 2019). Evaluating the effectiveness of SRCA interventions is therefore fundamental to enhancing health system performance and achieving the goals of Saudi Vision 2030, which prioritizes healthcare quality, efficiency, and accessibility (Saudi Vision 2030, 2016).

Response time is considered one of the most important indicators of EMS effectiveness. Studies have shown that shorter response times are strongly associated with improved survival in trauma and cardiac arrest cases (Blackwell & Kaufman, 2002; Nichol et al., 2016). In Saudi Arabia, however, research has highlighted variability in ambulance response times across regions, with urban centers often outperforming rural and remote areas (Alrazeeni, 2020). These disparities raise questions about equity, resource allocation, and system readiness in disaster and mass-casualty contexts.

Beyond response times, patient outcomes and service quality remain central to assessing EMS performance. Patient outcomes include not only survival rates but also functional recovery, patient satisfaction, and continuity of care (Ong et al., 2021). Service quality in prehospital care encompasses technical competence, adherence to clinical protocols, and the ability to provide culturally appropriate and patient-centered services (AlShammari et al., 2019). A systematic review of SRCA effectiveness that integrates these three domains—response times, patient outcomes, and service quality—can generate evidence to guide policy, training, and resource development.

Despite the critical role of SRCA, there is limited synthesized evidence on its effectiveness across different care domains. Previous studies have focused on isolated metrics such as delays in urban versus rural response (Alrazeeni, 2020) or challenges in EMS workforce training (Alanazi, 2012), but no comprehensive systematic review has consolidated the literature. This gap justifies a structured synthesis of available evidence to inform national strategies for strengthening prehospital emergency services.

Accordingly, this study aims to systematically review the effectiveness of Saudi Red Crescent prehospital emergency interventions, focusing on response times, patient outcomes, and service quality. By consolidating findings from existing research, this review seeks to identify strengths, highlight gaps, and propose recommendations that can contribute to advancing the quality and resilience of EMS in Saudi Arabia.

Aim of the Study

The aim of this systematic review is to evaluate the effectiveness of Saudi Red Crescent Authority (SRCA) prehospital emergency interventions by analyzing three critical dimensions: response times, patient outcomes, and service quality. Specifically, the study seeks to (a) assess patterns and challenges related to ambulance response times across urban and rural regions, (b) examine the impact of prehospital care on patient morbidity, mortality, and satisfaction, and (c) evaluate the quality of services delivered, including adherence to protocols, cultural competence, and workforce readiness. The ultimate goal is to synthesize

current evidence to provide actionable recommendations that can guide healthcare policymakers, EMS managers, and frontline providers in strengthening emergency medical services in Saudi Arabia.

Literature Review

Prehospital Emergency Care and Response Times

Response time has long been considered a cornerstone indicator of prehospital emergency effectiveness. Evidence consistently demonstrates that shorter response times are associated with improved survival, especially for cardiac arrest, stroke, and trauma cases (Blackwell & Kaufman, 2002; Nichol et al., 2016). In Saudi Arabia, several studies indicate disparities in ambulance response times between urban and rural settings. For instance, Alrazeeni (2020) found that SRCA response times in Riyadh met international benchmarks, while remote and desert areas experienced significant delays due to geographical and infrastructural challenges. These findings highlight the importance of resource allocation and technological support, such as GPS-based dispatch systems and air ambulances, in optimizing prehospital response.

Patient Outcomes in Prehospital Settings

Beyond rapid response, the effectiveness of EMS is ultimately judged by patient outcomes. Research across international contexts demonstrates that prehospital interventions, such as advanced airway management, defibrillation, and timely transfer, directly influence survival and neurological recovery (Ong et al., 2021). In Saudi Arabia, however, literature is less comprehensive, with studies often focusing on trauma outcomes. AlShammari et al. (2019) reported that trauma patients transported by SRCA had higher survival rates when advanced life support measures were initiated en route. Similarly, Alanazi (2012) emphasized the role of trained paramedics in reducing preventable deaths. Nonetheless, inconsistencies in training levels and scope of practice remain barriers to optimizing patient outcomes.

Service Quality and Workforce Competence

The quality of prehospital services is not limited to clinical outcomes but also includes organizational efficiency, workforce readiness, and patient-centered care. AlShammari et al. (2019) outlined how SRCA's evolving structure has improved EMS capacity but identified gaps in standardization of training and cultural sensitivity. Patient satisfaction surveys suggest that while SRCA provides life-saving services, issues such as delays, communication barriers, and gender-related service challenges persist (Alrazeeni, 2020). On a global level, the World Health Organization (WHO, 2018) stresses the importance of integrating quality indicators, such as adherence to evidence-based protocols and continuous professional development, to improve EMS service quality.

Systemic Challenges and Policy Context

The Saudi health system is undergoing major reforms as part of Vision 2030, which emphasizes healthcare quality, accessibility, and integration. EMS plays a critical role in this transformation, yet challenges remain. Workforce shortages, uneven distribution of services, and limited community awareness of EMS utilization have been identified as barriers to optimal performance (Alanazi, 2012; Alrazeeni, 2020). Technology adoption—such as e-health records, AI-supported dispatch, and telemedicine—has been proposed as a pathway to improve both response times and service quality (AlShammari et al., 2019). However, systematic evaluation of these reforms and innovations is still lacking.

Methods

Study Design

This study will adopt the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 framework to ensure methodological rigor, transparency, and reproducibility (Page et al., 2021). The review protocol follows internationally accepted guidelines for systematic reviews in health sciences and emergency medicine.

Eligibility Criteria
Inclusion Criteria

Studies will be included if they meet the following criteria:

1. **Population**: Patients receiving prehospital emergency medical services provided by the Saudi Red Crescent Authority (SRCA) in Saudi Arabia.
2. **Intervention**: Prehospital interventions including ambulance dispatch, advanced/ basic life support, trauma management, and patient transport.
3. **Outcomes**: At least one of the following reported—
    - Ambulance **response times**
    - **Patient outcomes** (mortality, morbidity, recovery, satisfaction)
    - **Service quality indicators** (adherence to protocols, workforce competence, patient perceptions)
4. **Study Type**: Quantitative, qualitative, or mixed-methods studies, as well as reviews and reports.
5. **Publication Language**: English or Arabic.
6. **Publication Period**: Studies published from 2000 to 2025 to capture the evolution of EMS services in Saudi Arabia.

Exclusion Criteria

- Studies not related to Saudi Arabia or not focused on SRCA.
- Opinion pieces, editorials, or commentaries without empirical data.
- Case reports with <5 patients.
- Studies not reporting on response times, outcomes, or service quality.

Information Sources

The following electronic databases will be systematically searched:

- **PubMed/MEDLINE**
- **Scopus**
- **Web of Science**
- **CINAHL (Cumulative Index to Nursing and Allied Health Literature)**
- **Saudi Digital Library (SDL)**
- **Google Scholar** (for gray literature and dissertations)

In addition, **official reports and documents from the Saudi Red Crescent Authority** and **Saudi Ministry of Health** will be reviewed.

Search Strategy

The search strategy will combine Medical Subject Headings (MeSH) and free-text terms using Boolean operators. The following keywords will be applied with necessary adaptations for each database

Study Selection

- All retrieved records will be imported into **EndNote** (or Zotero) to remove duplicates.
- Two independent reviewers will screen titles and abstracts.
- Full-texts of potentially eligible studies will be assessed according to inclusion/exclusion criteria.
- Discrepancies will be resolved by consensus or by a third reviewer.

Data Extraction

A standardized form will be used to extract:

- Study characteristics (author, year, region, design, sample size)
- Population and intervention details
- Reported outcomes (response times, patient outcomes, service quality)
- Key findings and limitations

Risk of Bias Assessment

- **Observational studies**: Joanna Briggs Institute (JBI) checklist
- **Randomized controlled trials**: Cochrane Risk of Bias tool
- **Qualitative studies**: Critical Appraisal Skills Programme (CASP) checklist

Data Synthesis

- A **narrative synthesis** will be performed due to expected heterogeneity in study designs and outcomes.
- Where data allows, subgroup analyses will compare urban vs. rural response times**,** trauma vs. cardiac emergencies**,** and before vs. after policy reforms (e.g., Vision 2030 initiatives)**.**

PRISMA Flow Diagram

The selection process will be illustrated using a PRISMA 2020 flow diagram, showing the number of studies identified, screened, excluded, and included in the final review.

Results

It is anticipated that the systematic review will identify significant variability in **SRCA ambulance response times** across different regions of Saudi Arabia. Urban centers are expected to demonstrate shorter response times, while rural and remote areas may face delays due to geographical challenges and limited resources.

Regarding **patient outcomes**, studies are likely to show improved survival and recovery in cases where advanced life support (ALS) interventions were applied promptly, particularly in trauma and cardiac

emergencies. However, variations in workforce training and scope of practice may limit consistency in patient outcomes.

In terms of **service quality**, the review is expected to highlight both strengths—such as SRCA's expanding infrastructure and integration with hospitals—and weaknesses, including gaps in cultural competence, patient satisfaction, and adherence to standardized protocols.

Overall, the synthesis will provide a comprehensive picture of SRCA's effectiveness, revealing progress in prehospital care delivery while pointing to areas requiring improvement.

Discussion

This systematic review is expected to demonstrate that while the Saudi Red Crescent Authority has made significant progress in strengthening prehospital emergency services, systemic challenges remain.

Response Times

The findings will likely affirm the critical role of response time as a determinant of survival, echoing global evidence (Blackwell & Kaufman, 2002; Nichol et al., 2016). Urban-rural disparities in Saudi Arabia will emphasize the need for tailored strategies, such as deploying air ambulances, GPS-based dispatch systems, and regional EMS hubs**.**

Patient Outcomes

The anticipated results on patient outcomes will reinforce the importance of trained paramedics and advanced interventions in improving survival. Similar to global studies (Ong et al., 2021), Saudi data will likely suggest that early initiation of ALS significantly reduces mortality. However, inconsistencies in training and limited female workforce participation may affect equitable access, highlighting the importance of capacity-building and gender-sensitive policies**.**

Service Quality

Service quality will emerge as a mediating factor between rapid response and improved outcomes. The review is expected to show that adherence to international protocols, effective communication, and cultural competence are areas for improvement. These findings align with WHO (2018), which stresses that prehospital systems must be evaluated not only for speed but also for safety, reliability, and patient-centeredness.

Policy Implications

Aligned with Saudi Vision 2030, improving EMS requires investments in technology (e.g., AI-based triage, telemedicine), workforce development, and community education on proper EMS utilization. Policymakers can use the synthesized evidence to redesign training curricula, expand services in underserved regions, and integrate SRCA more effectively within the national health system.

Conclusion

This systematic review will provide the first comprehensive synthesis of evidence on the effectiveness of Saudi Red Crescent prehospital emergency interventions**.** By examining response times, patient outcomes, and service quality, the review will highlight both achievements and persistent challenges.

The results are expected to show that SRCA has made measurable progress, particularly in urban centers, yet disparities in rural areas and gaps in quality indicators remain. To optimize outcomes, Saudi Arabia must invest in advanced EMS infrastructure, standardized training programs, and continuous quality improvement mechanisms**.**

Ultimately, strengthening SRCA services will contribute to improving patient survival, satisfaction, and overall healthcare system resilience**,** advancing the goals of Saudi Vision 2030 in creating a high-quality, accessible, and sustainable healthcare system.

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