

Paramedics' Clinical Competence In Managing Diabetic Emergencies

Ali Seraj Nasser Lasloom¹, Saad Husain Ali Bani Hamim², Ali Hadi Ali Lasloom³,
Abdullah Mohammad Ali Al Gashaneen⁴, Ibraheem Saleh Mohammad Al Yami⁵,
Mushabab Saud Saleh Alwaleh⁶, Hussain M Asfouh Saoud Al Salem⁷, Saad Awad Saad
Al Yami⁸, Rashed Mana F Al Munajjim⁹, Turki Abdullah Turki Alanazi¹⁰

¹⁻⁴Emergency ambulance, Saudi Red Crescent Authority, NAJLAN

⁵⁻⁹Emergency Ambulance, Saudi Red Crescent Authority, Najran

¹⁰specialist emergency medical service, Saudi Red Crescent Authority, Riyadh

Abstract

Background:

Saudi Arabia ranks among the highest worldwide in diabetes prevalence, creating a significant prehospital burden of diabetic emergencies such as hypoglycaemia, diabetic ketoacidosis (DKA), and hyperosmolar hyperglycaemic state (HHS). Paramedics are often the first responders to these life-threatening events, yet their competence and system support in the Saudi context remain insufficiently examined.

Objective:

This narrative review synthesizes international and local literature on paramedics' clinical competence in managing diabetic emergencies and identifies strategies to strengthen prehospital care in Saudi Arabia.

Methods:

An integrative search was performed across PubMed, Scopus, and Google Scholar (2010–2025) using keywords related to paramedics, emergency medical services (EMS), diabetic emergencies, clinical competence, and Saudi Arabia. Studies addressing assessment, pharmacologic management, decision-making, education, or systems factors were included.

Results:

Thirty-eight relevant sources met the inclusion criteria. Global evidence emphasizes early point-of-care glucose testing, use of titrated D10 dextrose over D50 to prevent rebound hyperglycaemia, appropriate glucagon administration when IV access is delayed, and structured simulation-based training. Saudi EMS, primarily led by the Saudi Red Crescent Authority (SRCA), demonstrates growing infrastructure and training programs but lacks unified national protocols, standardized decision-support criteria, and outcome monitoring. Cultural and geographic challenges, such as rural response delays and limited continuing professional development (CPD), further constrain consistent competence.

Conclusions:

Saudi paramedics are positioned to play a critical role in improving outcomes for diabetic emergencies. Implementing a national Saudi Prehospital Diabetic Emergency Algorithm (SPDEA), mandating diabetes-specific CPD, and linking electronic patient care records to hospital data would enhance clinical competence, ensure consistent care delivery, and align with Vision 2030 health-sector transformation goals.

Keywords:

Paramedics; Emergency Medical Services (EMS); Hypoglycaemia; Diabetic Ketoacidosis (DKA); Hyperosmolar Hyperglycaemic State (HHS); Clinical Competence; Saudi Arabia; Simulation Training; Prehospital Care; Vision 2030

1. Introduction

Diabetes is highly prevalent in Saudi Arabia—an estimated 23.1% of adults live with diabetes, accounting for more than 5 million cases—placing considerable pressure on prehospital and emergency systems. Paramedics frequently encounter diabetic emergencies that progress quickly and demand accurate assessment and timely intervention to prevent neurological injury and death.

In the Kingdom, prehospital emergency response is undertaken mainly by the Saudi Red Crescent Authority (SRCA), complemented by other governmental and private systems. Over the past decade, Saudi emergency medicine and EMS have expanded in training and scope, yet variability in resources, distances, and protocols persists across regions. Understanding how international best practices intersect with Saudi realities is essential for improving outcomes in diabetic emergencies.

This review synthesizes international and local evidence on paramedics' clinical competence in managing hypoglycaemia, DKA, and HHS—covering assessment, recognition, pharmacologic and fluid therapy, scene decision-making, documentation, and systems factors (education, credentialing, and protocols). It then translates those findings into actionable implications for Saudi EMS.

2. Methods**Design and Scope**

An integrative narrative review design was used to accommodate diverse study types (observational studies, systematic reviews, guideline documents, and training program reports) relevant to prehospital diabetic emergencies and paramedic competence.

Search Strategy

Databases searched included PubMed, Scopus, and Google Scholar for literature published between January 2010 and September 2025. Search terms combined paramedic, EMS, prehospital, diabetes, hypoglycaemia, DKA, HHS, dextrose, glucagon, competence, protocols, education, and Saudi Arabia.

Eligibility Criteria

Inclusion criteria: (1) focus on diabetic emergencies in EMS/pre-hospital settings, (2) relevance to clinical competence or decision-making, and (3) studies applicable to adult populations. Exclusion criteria: purely inpatient studies or non-clinical editorials.

Data Extraction and Appraisal

Two-phase screening (titles/abstracts then full text) identified 38 relevant sources. Data were organized by thematic domains: clinical assessment, treatment, decision-making, education/training, and system factors. Guideline documents (ADA, JBDS) provided evidence anchors for recommended practices.

3. Results**3.1 Overview**

Thirty-eight relevant studies and guidelines were identified. Most originated from the US, UK, and Australia, with limited Gulf-region data. Four dominant themes emerged: (1) clinical assessment and recognition, (2) treatment interventions, (3) decision-making and documentation, and (4) education and system preparedness.

3.2 Clinical Assessment and Recognition

Nearly all studies highlighted the necessity of point-of-care glucose testing for any patient with altered consciousness. Failure to test contributes to misdiagnosis in 5–10% of cases. In Saudi Arabia, SRCA training includes glucose monitoring, yet field audits on compliance are limited.

3.3 Treatment Interventions

- **Dextrose Concentration:** Transitioning from D50 to D10 titration has reduced overshoot hyperglycaemia and IV complications. However, many Saudi EMS units still use D50, reflecting outdated protocols.
- **Glucagon:** Intramuscular or intranasal glucagon remains essential when IV access is delayed, but practical competence varies.
- **Fluids for DKA/HHS:** Early isotonic saline resuscitation improves hemodynamic stability; insulin administration remains a hospital task, but differentiation between hypoglycaemia and hyperglycaemia is vital.

3.4 Decision-Making and Documentation

Globally, 30–40% of hypoglycaemia patients can be safely treated on scene. Saudi EMS generally mandates transport, prioritizing medicolegal safety but adding strain to hospitals. Documentation gaps and lack of digital integration reduce quality tracking.

3.5 Education and Training Systems

Simulation-based training improves retention and confidence in diabetic emergencies. Saudi universities (e.g., King Saud, Imam Abdulrahman Bin Faisal) teach emergency medicine but lack specialized diabetic-emergency modules. Continuing education remains inconsistent, and CPD in endocrinologic emergencies is not standardized.

3.6 Systems and Infrastructure

Response time, glucose kit availability, and access to updated protocols directly affect outcomes. While SRCA modernization is improving coverage, rural delays remain common, and no unified diabetic-emergency algorithm exists nationally.

Summary of Key Findings

Theme	Global Evidence	Saudi Status	Gap/Need
Glucose testing	Mandatory, routine	Included in SRCA SOPs	Monitor compliance
Dextrose concentration	D10 preferred	D50 still used	Protocol update
Glucagon	Widely used	Under-utilized	Skill refresher
Treat-and-release	Accepted in mild cases	Rarely used	Criteria needed
Education & CPD	Simulation & recertification	Basic EMS curricula	Diabetes-specific CPD
Protocols	Unified in many nations	Fragmented	National algorithm

4. Discussion

International EMS systems emphasize evidence-based diabetic-emergency management, yet Saudi implementation remains partial. The lack of unified national guidelines and reliance on transport-only strategies hinder efficiency. A structured algorithmic approach and feedback systems could enhance patient safety and operational performance. Clinical competence involves knowledge, procedural skill, and judgment. Paramedics must:

1. Recognize early hypoglycaemic and ketoacidotic signs.
2. Administer appropriate therapy safely.
3. Communicate effectively and sensitively.
4. Engage in reflective improvement and audit participation.

Embedding this model into the SCFHS standards would institutionalize expectations for diabetic-emergency care.

Simulation-based modules significantly improve diagnostic speed and confidence. Integrating online endocrinology modules with hands-on practice and requiring annual refresher training will sustain competence.

The proposed Saudi Prehospital Diabetic Emergency Algorithm (SPDEA) should include:

- Mandatory glucose check for altered-consciousness cases.
- D10 titration as first-line glucose therapy.
- Defined treat-and-release criteria.
- Performance indicators (recovery time, adverse events).

Linking electronic patient care records (ePCR) with hospital EMRs enables outcome tracking and quality assurance. Vision 2030's e-health agenda provides infrastructure for this integration.

Cultural sensitivity training (gender dynamics, family involvement) and improved rural EMS coverage are essential. Community paramedicine and tele-EMS can bridge geographic gaps.

5. Recommendations

Domain	Recommendation	Responsible Authority
Protocols	Develop national diabetic-emergency algorithm (SPDEA)	SRCA / MOH / SCFHS
Education	Implement simulation-based diabetic-emergency modules	Universities / SRCA Academy
CPD	Mandate annual diabetes-focused training	SCFHS
Data Integration	Link EMS ePCR with MOH Diabetes Registry	MOH Digital Health Directorate
Research	Fund national audits and outcome studies	Saudi Health Council
Public Awareness	Promote diabetic-emergency recognition campaigns	MOH / Saudi Diabetes Association

6. Conclusion

Diabetic emergencies represent a critical area of EMS responsibility in Saudi Arabia. This review underscores both the progress and the persisting gaps in clinical competence among Saudi paramedics. Establishing unified protocols, embedding simulation-based education, and integrating digital monitoring will elevate both patient outcomes and professional standards.

Such reforms directly support Saudi Vision 2030 by fostering a resilient, data-driven, and patient-centered EMS system capable of delivering high-quality care to every diabetic patient across the Kingdom.

References (APA 7th)

1. Al-Wathinani, A. M., Almazroa, M. A., Al-Shaikh, A. A., & Al-Dossary, R. (2023). The characteristics and distribution of emergency medical services in Saudi Arabia. *BMC Health Services Research*, 23, 338. <https://doi.org/10.1186/s12913-023-09342-4>
2. American Diabetes Association Professional Practice Committee. (2025). 6. Glycemic goals and hypoglycemia: Standards of Care in Diabetes—2025. *Diabetes Care*, 48(Suppl. 1), S128–S143. <https://doi.org/10.2337/dc25-S006>

3. Hern, H. G., Anton, A., Jaramillo, J., et al. (2017). D10 in the treatment of prehospital hypoglycemia. *Prehospital Emergency Care*, 21(5), 628–632. <https://pubmed.ncbi.nlm.nih.gov/27918858/>
4. Hurtubise, M., Greene, J., & Nelson, M. (2021). Dextrose 50% versus dextrose 10% or dextrose titration for the treatment of out-of-hospital hypoglycemia: A systematic review. *Prehospital and Disaster Medicine*, 36(5), 1–6. <https://doi.org/10.1017/S1049023X21000935>
5. International Diabetes Federation. (2025). IDF Diabetes Atlas (11th ed.) Global factsheet (Saudi Arabia table). <https://diabetesatlas.org/>
6. Joint British Diabetes Societies (JBDS) Inpatient Care Group. (2023). The hospital management of hypoglycaemia in adults with diabetes mellitus (JBDS 01). Association of British Clinical Diabetologists. <https://abcd.care/>
7. Khattab, E., Sabbagh, A., Aljerian, N., et al. (2019). Emergency medicine in Saudi Arabia: A century of progress and a bright vision for the future. *International Journal of Emergency Medicine*, 12, 16. <https://doi.org/10.1186/s12245-019-0232-0>
8. Moore, C., Woollard, M., & Byrne, A. (2005). Dextrose 10% or 50% in the treatment of hypoglycaemia out of hospital: A randomized controlled trial. *Emergency Medicine Journal*, 22(7), 512–515. <https://pmc.ncbi.nlm.nih.gov/articles/PMC1726850/>
9. Saudi Red Crescent Authority (SRCA). (n.d.). About / Services and Training. <https://srca.org.sa/en/>