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Medical regulation and pre-hospital management of glycemic disorders in emergencies: An integrative review

Regulação médica e manejo pré-hospitalar dos distúrbios glicêmicos em emergências: revisão integrativa

Regulación médica y manejo prehospitalario de los trastornos glucémicos en emergencias: una revisión integradora

ABSTRACT

Objective: To identify the scientific evidence available in the literature regarding prehospital care provided to patients with glycemic disorders in the context of the Emergency Dispatch Center. **Method:** This integrative literature review adopted the PICO strategy and implemented the search in the MEDLINE/PubMed, Cochrane Library, Scopus, and LILACS databases, without language or period restrictions. Two independent reviewers selected the studies. **Results:** The conclusion of selection process resulted in four studies that comprised the final sample. The findings reveal that intravenous glucose is faster and more effective in reversing severe hypoglycemia compared to intramuscular glucagon. Furthermore, the use of clinical protocols and assessment tools contributes to safer decisions in prehospital care. **Conclusion:** The appropriate management of glycemic disorders in the prehospital setting depends on early identification, the correct choice of therapeutic agent, and the adoption of care protocols.

Keywords: *Hypoglycemia; Hyperglycemia; Emergency Medical Dispatcher.*

RESUMO

Objetivo: Identificar as evidências científicas disponíveis na literatura acerca da assistência pré-hospitalar prestada ao paciente com distúrbios glicêmicos no contexto da Central de Regulação de Urgência. **Método:** Trata-se de uma revisão

integrativa da literatura que adotou a estratégia PICO e implementou a busca nas bases de dados MEDLINE/PubMed, Cochrane Library, Scopus e LILACS, sem restrição de idioma ou período. Dois revisores independentes selecionaram os estudos. **Resultados:** A conclusão do processo de seleção resultou em quatro estudos que compuseram a amostra final. Os achados evidenciam que a glicose intravenosa apresenta maior rapidez e eficácia na reversão de hipoglicemias graves em comparação ao glucagon intramuscular. Além disso, a utilização de protocolos clínicos e ferramentas de avaliação contribui para decisões mais seguras no atendimento pré-hospitalar. **Conclusão:** O manejo adequado dos distúrbios glicêmicos no contexto pré-hospitalar depende da identificação precoce, da escolha correta do agente terapêutico e da adoção de protocolos assistenciais.

Palavras-chave: *Hipoglicemia; Hiperglicemia; Operador de Emergência Médica.*

RESUMEN

Objetivo: Identificar la evidencia científica disponible en la literatura sobre la asistencia prehospitalaria prestada a pacientes con trastornos glucémicos en el contexto de la Central de Regulación de Urgencias. **Método:** Esta revisión integradora de la literatura adoptó la estrategia PICO y llevó a cabo la búsqueda en las bases de datos MEDLINE/PubMed, Cochrane Library, Scopus y LILACS, sin restricciones de idioma ni periodo. Dos revisores independientes seleccionaron los estudios. **Resultados:** La conclusión del proceso de selección dio lugar a cuatro estudios que conformaron la muestra final. Los resultados evidencian que la glucosa intravenosa presenta mayor rapidez y eficacia en la reversión de hipoglucemias graves en comparación con el glucagón intramuscular. Además, el uso de protocolos clínicos y herramientas de evaluación contribuye a tomar decisiones más seguras en la atención prehospitalaria. **Conclusión:** El manejo adecuado de los trastornos glucémicos en el contexto prehospitalario depende de la identificación precoz, de la elección correcta del agente terapéutico y de la adopción de protocolos asistenciales.

Descriptores: *Hipoglucemia; Hiperglucemia; Operador de Emergencias Médicas.*

INTRODUCTION

Glycemic disorders may be defined as hypoglycemia or hyperglycemia and are characterized by low (<70 mg/dL) or high (200 mg/dL) plasma glucose concentrations, respectively. These disorders affect the population regardless of health status but occur more frequently among individuals with comorbidities, particularly diabetes mellitus (DM)¹.

An estimated 537 million adults aged 20-79 years were living with diabetes in 2021, with projections reaching 643 million by 2030 and 783 million by 2045². Brazil ranks sixth worldwide in the number of people with DM, behind only China, India, Pakistan, the United States, and Indonesia².

Although hypoglycemia and hyperglycemia occur more frequently in people with diabetes mellitus, these conditions are not restricted to this group. Therefore, health professionals must carefully investigate each case to ensure an appropriate intervention³. During an episode of glycemic disturbance, patients must receive prompt assistance to prevent complications. In this context, prehospital care begins through the Emergency Dispatch Center (CRU), which provides guidance on immediate care and, when necessary, dispatches an ambulance team to the scene.

Understanding scientific advances in the management of glycemic disorders within urgent and emergency care is crucial for expanding the knowledge of professionals involved in patient care and updating current clinical practices. Moreover, the information obtained from this review will become part of the scientific evidence base supporting the development of protocols for the Ceará Emergency Dispatch Center. Developing a protocol as a care tool is of paramount importance for ensuring appropriate patient reception and sound clinical decision-making⁴. Thus, this study aimed to identify the scientific evidence available in the literature regarding prehospital care provided to patients with glycemic disorders within the Emergency Dispatch Center context.

METHODS

This integrative review followed the recommendations of Mendes, Silveira, and Galvão and was reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist⁵.

The guiding question was formulated as per the PICO strategy, in which P (population) represented patients with glycemic disorders; I (intervention), prehospital care; and O (outcome), the Emergency Dispatch Center. The Comparison (C) component was not used in this study. Thus, the following guiding question was established: What scientific evidence is available in the literature regarding prehospital care provided to patients with glycemic disorders within the Emergency Dispatch Center context? All studies addressing glycemic disorders in adults were included, whereas studies involving children were excluded. No language or publication period restrictions were applied.

The search strategy was developed in December 2024 using controlled descriptors (MeSH and DeCS) and keywords based on the relevant terms identified, combined with the Boolean operators “AND” and “OR”. The MEDLINE/PubMed, Cochrane Library, Scopus, and LILACS databases were searched. The search strategy was adapted according to the recommendations of each database.

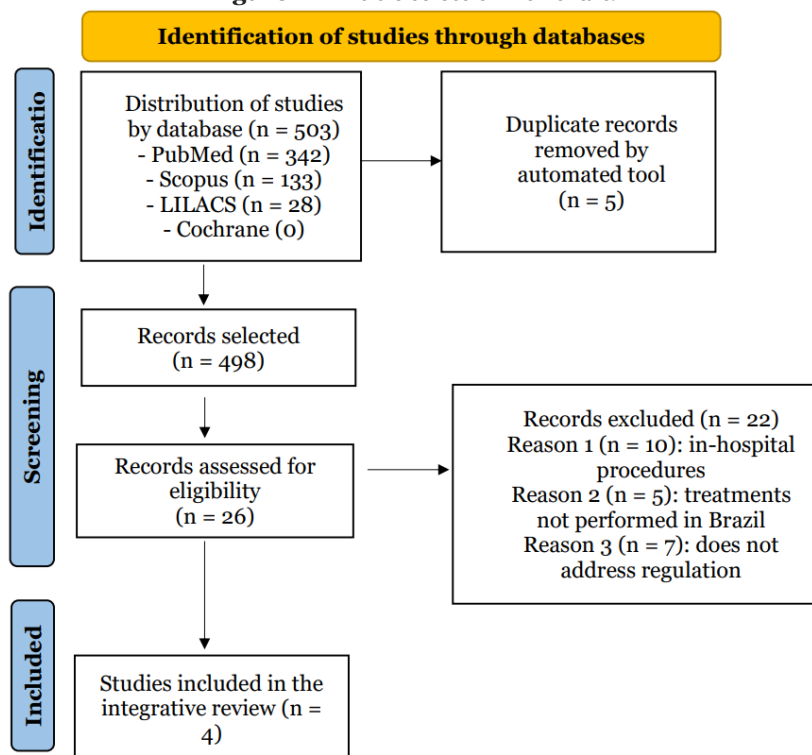
The publications were exported to the Rayyan-Intelligent Systematic Review software (RAYYAN)⁶, where duplicates were removed. Two independent reviewers screened the titles and abstracts to identify potentially eligible articles for full-text assessment. Articles included after title and abstract screening were selected for full-text review. Any disagreement during the selection process was resolved by consulting subject-matter experts to support decision-making.

Two reviewers extracted the data using a form developed by the authors that included the following variables: author(s), publication year, country of origin of the study, objective, study design, and main interventions. The data were analyzed by categorizing the findings, organizing them into charts, and discussing them based on the available literature on the topic.

RESULTS

Initially, 503 publications were identified in the databases. After duplicate removal and title and abstract screening, 26 studies were preselected for full-text review. Twenty-two studies were excluded because they did not meet the inclusion criteria. Therefore, the final sample of this review comprised four studies, as shown in the flowchart (Figure 1).

The included studies were conducted in the United Kingdom, with two in England and one in Scotland, and one study was conducted in the United States of America (USA). The works were published between 1997 and 2018, and their methodological designs comprised a literature review, a mixed-methods study, a retrospective cross-sectional study, and a quasi-experimental study (Table 1).

Figure 1 – Article selection flowchart.

Source: Prepared by the authors.

Table 1 – Distribution of studies by author, year of publication, study design, thematic category, and main findings. Fortaleza, Ceará, Brazil, 2024.

Author/Year	Design	Thematic Category	Main findings
Category 1 – Therapeutic management of hypoglycemia			
Howell et al., 1997 ⁷	Quasi-experimental	Therapeutic effectiveness	Intravenous glucose promoted significantly faster recovery (median of 3 min) than glucagon (17.5 min).
Parsaik et al., 2013 ⁸	Retrospective cross-sectional	Therapeutic effectiveness	66% of patients received IV dextrose, 25% oral glucose, and 2% glucagon, revealing a preference for intravenous glucose in pre-hospital care.
Category 2 – Protocols and clinical decision-making			
Roberts et al., 2003 ⁹	Literature review	Transportation criteria	Proposes clinical criteria for hospital referral following hypoglycemia, considering age, comorbidities, clinical recovery, and post-treatment blood glucose levels.
Duncan et al., 2018 ¹⁰	Mixed-methods	Clinical assessment	Recommends using the Gold Score to

			identify impaired awareness of hypoglycemia and guide outpatient follow-up.
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Source: Prepared by the authors.

The included studies had heterogeneous designs and objectives. Two studies investigated the effectiveness of therapeutic interventions used in the pre-hospital management of hypoglycemia, while the other two focused on clinical recommendations and protocols for patient assessment, referral, and follow-up. Consequently, the results were organized into two thematic categories to facilitate a more consistent synthesis of the available evidence.

DISCUSSION

The results reported in the analyzed studies reinforce the importance of selecting the appropriate route of administration and therapeutic agent for the prehospital management of hypoglycemic emergencies, as well as adopting assessment and follow-up protocols.

Category 1 – Therapeutic agent in pre-hospital management

Studies evaluating the effectiveness of pharmacological interventions showed that intravenous glucose remains the first-line strategy for reversing severe hypoglycemia in prehospital care. When patient recovery time was assessed, intravenous (IV) glucose performed better than intramuscular (IM) glucagon. The median recovery time after IV glucose administration was 3 minutes (95% CI: 2–6), without compromising the overall speed of treatment⁷, whereas glucagon use resulted in a median recovery time of 17.5 minutes (95% CI: 15–34).

These results corroborate those of the study conducted in the United States, which showed that most patients (66%) were resuscitated with intravenous dextrose, followed by oral glucose (25%) and subcutaneous glucagon (2%)⁸. This finding demonstrates that, besides its greater clinical effectiveness, intravenous glucose is also the main strategy used by emergency medical services.

Intravenously administered glucose is the most effective method for reversing severe hypoglycemia because it is absorbed immediately and is widely used in hospital and prehospital services¹¹. Glucagon, in turn, is used when IV access is difficult to obtain and is considered a second-line option because it has a slower action onset, resulting in very variable responses. Despite these findings, there is a lack of high-quality comparative studies in the prehospital setting, particularly those involving hyperglycemia, indicating the need for further research evaluating different therapeutic strategies in this context.

Category 2 – Recommendations for assessment protocols and care pathways

Assessment and follow-up protocols

Establishing clinical prehospital care protocols is essential because they support rapid and effective decision-making. Unlike the previous studies, Roberts et al.⁷ and Duncan et al.⁸ did not evaluate the effectiveness of therapeutic interventions but proposed recommendations aimed at organizing prehospital care.

When caring for a patient experiencing hypoglycemia or hyperglycemia, the team should identify the key signs and symptoms indicating the need for transfer: advanced age; use of oral hypoglycemic medications; relevant comorbidities; lack of a previous diagnosis of diabetes; post-treatment blood glucose <4.4 mmol/L; failure to recover mental status within 10 minutes; use of glucagon during care; and evidence of complicating factors, such as persistent altered mental status, suspected head trauma, stroke, or epilepsy⁹.

Furthermore, the study conducted in Scotland highlights the importance of the Gold score, administered by the emergency doctor while the patient is still in the ambulance. This assessment identifies individuals with impaired awareness of hypoglycemia, a condition whose adequate management may reduce the frequency of subsequent severe episodes¹⁰. Therefore, the Gold score serves as a complementary tool for patients who have experienced severe hypoglycemic emergencies.

Assessing blood glucose levels before and during treatment is essential, as is conducting a detailed assessment of the patient's health history. These measures help identify the underlying cause of the hypoglycemic or hyperglycemic disorder, improve clinical management, and prevent recurrence. They also contribute to building a more robust database that may support future revisions of protocols and care practices.

This review reinforces that structured protocols for clinical assessment, referral, and follow-up are essential components of high-quality prehospital care, even in the absence of new pharmacological interventions.

LIMITATIONS

A lack of primary studies on the prehospital management of glycemic disorders, particularly those addressing hyperglycemia and the role of the Emergency Dispatch Center was a limitation of this review. Considering that the search was conducted across four broadly comprehensive databases, without language or publication period restrictions, using specific strategies reviewed by a librarian, the limited number of studies likely reflects a gap in the literature rather than a limitation of the search strategy.

FINAL CONSIDERATIONS

The studies analyzed indicate that intravenous glucose is the gold standard for treating severe hypoglycemia because of both its rapid recovery time and predictable response. However, glucagon continues to play an important role as an alternative in specific situations, particularly in prehospital settings where immediate venous access is unavailable. Identifying the signs and symptoms of glycemic disorders during prehospital care is vital for appropriate case management, directly affecting the treatment process and hospital discharge, when necessary.

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