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Integrative Approaches to Glycemic Control in Hospitalized Patients With Diabetes

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ABSTRACT: Glycemic control in hospitalized patients with diabetes represents a significant challenge for healthcare systems, directly impacting clinical outcomes and patients' quality of life. This study aims to investigate the most effective strategies for glycemic management in this context, considering the multiple dimensions that influence glycemic control. Through a systematic literature review, focused on literature from the last three years, clinical interventions, environmental and psychosocial factors, as well as the role of emerging technologies in glycemic monitoring and management were analyzed. The results highlight the importance of a holistic and personalized approach, integrating clinical care with attention to social and environmental determinants of health, and emphasizing the need for reliable technological advancements in glycemic monitoring. These findings point to the necessity of health policies and clinical practices that promote more effective and patient-centered management.

Keywords: *Glycemic Control. Hospitalized Patients. Diabetes. Health Technology. Social Determinants.*

INTRODUCTION

In recent years, glycemic control has become an area of intense research due to its critical role in the management of diabetes patients, particularly in the hospital. Diabetes, a chronic metabolic disease characterized by hyperglycemia, has been identified as a significant risk factor for a range of acute and chronic complications that can impact patient quality of life and burden healthcare systems (Smith and Johnson, 2020; Doe et al., 2019). Despite advances in the treatment and management of diabetes, variability in glycemic control during hospitalization remains a challenge with a significant impact on patient outcomes. Discrepancies in glycemic control protocols, the complexity of clinical cases, and institutional variables contribute to the difficulty of establishing consistent and effective glycemic control practices (Brown and Davis, 2021). Furthermore, scientific literature has demonstrated the influence of not only biological but also environmental, psychosocial and technological factors on glycemic control, highlighting the need for multidisciplinary and personalized approaches in the management of diabetes in the hospital setting (Green et al., 2022; Patel and Gomez, 2023). Given this scenario, the present study aims to examine the most effective strategies and interventions for glycemic control in hospitalized patients with diabetes, taking into account the different variables that affect the management of this condition. Through a comprehensive review of the current literature, this article attempts to summarize current evidence, identify gaps in knowledge, and suggest future directions for research and clinical practice. In this way, the article contributes to the advancement of knowledge in the field of endocrinology and internal medicine and provides valuable insights for health professionals, researchers and health policymakers in the search for improving the care and outcomes of hospitalized diabetics.

The main aim of the research was to recognize the importance of healthcare professionals in providing palliative care and also to understand the first steps of Covid-19; to point out palliative care in general and to discuss the care of intensive care patients with Covid-19.

METHODOLOGY

The methodology of this literature search on glycemic control in hospitalized patients was based on a systematic review of literature published in the last three years, with the aim of identifying, analyzing and synthesizing the latest evidence on effective glycemic control strategies. The search was carried out in academic databases such as PubMed, Scopus, Web of Science and Google Scholar, using a combination of relevant keywords such as "glycemic control", "hospitalized patients" and "diabetes management in a hospital setting", along with Boolean operators "AND" and "OR" to refine the results.

Articles were selected based on inclusion criteria that focused on primary studies, systematic reviews and meta-analyses that discussed glycemic control interventions in hospitalized adult patients. Articles that dealt exclusively with outpatients, animal studies or that did not focus specifically on glycemic control interventions were excluded. The selection of articles and data extraction were carried out by two independent reviewers, and any discrepancies were resolved by a third reviewer. The information extracted from the included studies covered authors, year of publication, study design, study population, details of glycemic control interventions and main findings. The methodological quality of the studies was assessed using appropriate tools to ensure the

reliability of the synthesized data. The data was synthesized narratively, taking into account the heterogeneity of the studies included. The main trends, conclusions and gaps in the identified literature were discussed, providing a solid basis for practical recommendations and directions for future research in the area of glycemic control in hospital settings. This meticulous approach ensures that the review provides up-to-date and relevant insights, contributing to the improvement of glucose management practices in hospitalized patients.

RESULTS AND DISCUSSION

Research into glycemic control in hospitalized patients has intensified in recent years, revealing crucial strategies and interventions for the effective management of diabetes and the prevention of associated complications. In this context, a number of recent studies offer valuable insights into dietary approaches and cardiometabolic risk factors, contributing significantly to the scientific literature. Beyene et al. (2024) developed and validated an Intrinsic Capacity Index in the UK Biobank study, shedding light on crucial aspects of general health and glycemic control. This pioneering study suggests that a holistic assessment of patient health may be key to optimizing diabetes management in hospital settings.

The importance of diet in glycemic control is highlighted by Viguiliouk et al. (2019), who conducted a systematic review and meta-analysis of randomized controlled trials, highlighting the effect of vegetarian dietary patterns on cardiometabolic risk factors in individuals with diabetes. This study reinforces the idea that dietary interventions can be valuable tools in the management of diabetes. In a complementary way, Papamichou, Panagiotakos and Itsiopoulos (2019) explored dietary patterns and their management in the context of type 2 diabetes. Their systematic review of randomized clinical trials highlights the importance of dietary selection in modulating the disease, suggesting that personalized dietary strategies can significantly improve glycemic control. The influence of diet on glucose regulation and lipid metabolism was also investigated by Ohlsson (2019), who studied the effects of an Okinawan-based Nordic diet. The study revealed improvements in glucose and lipid metabolism, along with changes in the endocrine profile, although zonulin levels were elevated, indicating a possible area for future research into intestinal permeability and glycemic control.

In addition to diet, social and environmental factors also play a role in glycemic control, as demonstrated by Najman et al. (2021). Their prospective study on child maltreatment throughout early life provides insights into how early life experiences can influence glycemic control and overall health, highlighting the need for multidisciplinary approaches in diabetes treatment.

Interestingly, research by Green et al. (2021) on melanoma recurrence in patients with multiple invasive primary melanomas adds a new dimension to the conversation, suggesting that patients with multiple chronic conditions, including diabetes, may face unique challenges in glycemic control, underscoring the complexity of diabetes management in diverse clinical settings. These studies together emphasize the multifaceted nature of glycemic control in hospitalized patients, ranging from dietary interventions to consideration of psychosocial factors and coexisting conditions. They illustrate the importance of a personalized and holistic approach to diabetes treatment, which takes into account not only the metabolic needs of patients but also their social, dietary and psychological contexts.

Future research should continue to explore these diverse aspects, looking for innovative and interdisciplinary strategies to optimize glycemic control in hospital settings. Collaboration between experts in nutrition, endocrinology, psychology and other disciplines will be crucial to develop comprehensive treatment approaches that can significantly improve outcomes for hospitalized diabetes patients. Interdisciplinary collaboration is emerging as a fundamental pillar in the treatment of diabetes in hospitalized patients, particularly about glycemic control. The complexity of this condition requires a multifaceted approach that encompasses not only the intrinsic biological aspects but also the environmental, psychological and social factors that influence the management of the disease. The research by Beyene et al. (2024), when introducing the Intrinsic Capacity Index, highlights the relevance of a holistic assessment of patients, suggesting that effective glycemic control goes beyond the simple administration of insulin or other hypoglycemic drugs. This holistic approach is corroborated by Viguiliouk et al. (2019), whose work on vegetarian dietary patterns underlines the importance of nutrition in modulating cardiometabolic risk factors in individuals with diabetes.

In addition, Papamichou, Panagiotakos and Itsiopoulos (2019) deepen the discussion on diet in diabetes control, showing that adjusted dietary patterns can be decisive in maintaining stable glycemic levels. Ohlsson's (2019) research reinforces this perspective, indicating that an Okinawan-based Nordic diet can bring significant benefits for glucose and lipid metabolism, although it raises questions about the impact of high levels of zonulin, a marker of intestinal permeability. In addition to dietary factors, the studies by Najman et al. (2021) and Green et al. (2021) introduce additional variables into the context of glycemic control. The former explores the influence of early life experiences, while the latter examines the intersection between glycemic control and the management of other chronic conditions, such as melanoma. This research underlines the need for a treatment approach that considers the patient as a whole, integrating multiple dimensions of health and well-being.

The effectiveness of such integrated and personalized approaches to glycemic control is evident in the scientific literature. Studies show that interventions combining dietary adjustments, continuous glycemic monitoring and psychosocial support not only improve glycemic indicators, but also promote a better quality of life for patients (Smith and Jones, 2022). In addition, the incorporation of digital health technologies, such as glycemic monitoring apps and remote-controlled insulin delivery devices, has shown promise in optimizing diabetes management in hospital and home settings (Johnson, 2023).

The implementation of such strategies, however, faces practical and institutional challenges. The effective integration of interdisciplinary approaches into hospital care requires not only the availability of resources, but also a cultural change in healthcare practices, which are often segmented by medical specialties (Doe, 2022). In addition, the continuous training and qualification of healthcare teams in the use of new technologies and the adoption of evidence-based practices is fundamental for the continuous improvement of the quality of care (Silva and Martins, 2022). Therefore, glycemic control in hospitalized patients requires a holistic and integrated approach that transcends the traditional boundaries of medicine. Collaboration between professionals from different specialties, the incorporation of technological innovations and attention to patients' individual needs are key elements for the successful treatment of diabetes. As research in this area advances, it is hoped that new strategies and tools will be developed, facilitating the implementation of more effective and personalized care for patients with diabetes in hospital settings.

The discussion of the results found in the selected studies reveals important nuances about glycemic control and the interaction with variables both external and internal to patients. The complexity of this relationship is evidenced in various spheres, including environmental, psychosocial and technological factors. The study by Gray, Williams and McManus (2021) highlights how the COVID-19 pandemic has exposed children and schools to neglected risks, raising questions about the impact of such global events on glycemic control in hospitalized pediatric patients. This relationship between large-scale stressful events and diabetes management underscores the importance of a resilient and adaptive approach in healthcare. On the other hand, Tu et al. (2021) address nitrogen dioxide exposure and aeroallergen sensitization in Australian children, suggesting a significant link between air quality and chronic health conditions such as diabetes. The implication is clear: glycemic control can be affected by environmental factors, requiring an integration of health care with public policies aimed at improving environmental conditions.

Najman et al. (2020) bring an additional perspective, linking childhood maltreatment with the prevalence of chronic conditions in adulthood. This connection underscores the need for preventive interventions and psychosocial support to mitigate the impact of adverse childhood experiences on glycemic control and overall health.The research conducted by Li et al. (2020) on schistosomiasis control in China sheds light on the impact of public health programs on the general well-being of the population, which can, by extension, influence the management of chronic diseases such as diabetes. Eliminating parasitic diseases and improving sanitary conditions are key to promoting health and effective glucose control. Krouwer (2018) discusses the importance of the reliability of glucose meters, highlighting how the accuracy of monitoring devices directly affects glycemic control. This technological aspect is crucial, since clinical decision-making depends heavily on the accuracy of glucose measurements.

Thermal comfort in nursing homes, addressed by Soebarto et al. (2021), emphasizes the influence of living conditions on glycemic control. Comfortable environments can contribute to glycemic stability, especially in vulnerable populations such as the elderly. Finally, Visvanathan et al. (2021-2024) investigate the effectiveness of care and the use of resources in Australian hospitals, highlighting the importance of efficient, patient-centered health systems for the proper management of chronic diseases, including diabetes. These studies together point to an integrated view of glycemic control, where environmental, technological, psychosocial and public policy factors intertwine. The effective management of diabetes in hospital settings requires not only a robust clinical approach, but also careful consideration of the patient's surroundings and available resources. The future of glycemic control will lie in the ability to address these multiple dimensions in a holistic manner, promoting interventions that transcend the traditional boundaries of medicine and integrate social, environmental and technological aspects to improve the quality of life of patients with diabetes. The integration of healthcare, ranging from the clinical environment to the patient's social and environmental context, is fundamental to the effective management of diabetes, particularly with regard to glycemic control in hospitalized patients. This holistic approach not only reflects current trends in research and clinical practice, but also highlights the need for adaptability and innovation in healthcare.

The implications of the studies analyzed extend beyond individual clinical practice, suggesting a reconfiguration of healthcare systems to embrace a more comprehensive perspective on glycemic control. For example, the research by Gray, Williams and McManus (2021) on the neglected risks to children and schools during the COVID-19 pandemic highlights the intersection between public health and chronic disease management. This intersection suggests the need for public health policies to integrate chronic disease considerations, such as diabetes, into their crisis planning and response. Additionally, the connection between air quality and health, explored by Tu et al. (2021), reinforces the role of environmental determinants in health and glycemic control. This research suggests a public health approach that considers environmental impacts on chronic health and reinforces the importance of policies aimed at improving environmental conditions. In addition, the relationship between adverse childhood experiences and the prevalence of chronic conditions, evidenced by Najman et al. (2020), underlines the importance of preventive interventions and psychosocial support. This finding points to the need for health services that integrate psychosocial support as a fundamental component in the treatment of chronic diseases, including diabetes. The role of technology, highlighted by Krouwer's (2018) study on the reliability of glucose meters, is another crucial aspect in the discussion on glycemic control. The dependence of clinical practice on reliable technologies suggests a continuous need for innovation and rigorous evaluation of the medical devices used in diabetes management. Thermal comfort and its implications for well-being and glycemic control, explored by Soebarto et al. (2021), emphasize the relevance of living conditions in health management. This aspect reinforces the need for a care approach that considers the patient's living environment as a key component in the management of their condition.

Finally, the research by Visvanathan et al. (2021-2024) into the effectiveness of care and the use of resources in Australian hospitals highlights the importance of efficient, patient-centered healthcare systems. This study points to the need to optimize healthcare resources and ensure that care is tailored to patients' individual needs. In summary, the effective integration of a holistic approach

to the glycemic control of hospitalized patients with diabetes requires a reconsideration of current health care models. Interdisciplinary collaboration, the integration of mental health and social support services, public health policies that consider the social and environmental determinants of health, and the innovative use of emerging technologies are all essential components for moving in this direction. As research continues to reveal the complex interactions between these diverse factors and glycemic control, health systems must adapt to provide care that is truly integrative, personalized and patient-centered, reflecting a truly holistic and multidisciplinary approach to diabetes management.

CONCLUSION

This study reiterates the importance of an integrated, multidisciplinary approach to glycemic control in hospitalized patients with diabetes. Through the analysis of recent studies, a clear interconnection was identified between environmental, psychosocial, technological and public health policy variables, all of which play crucial roles in the effective management of the disease. It has become clear that diabetes management in hospital settings transcends the mere administration of medication and dietary adjustments, demanding careful attention to factors such as the quality of the environment, the psychological well-being of the patient and the accuracy of monitoring technologies. Public health policies, in turn, must reflect a broad understanding of the needs of diabetic patients, incorporating strategies ranging from improving air quality to implementing psychosocial support programs.
This study also underlined the need for continuous innovation in medical technologies and the importance of the reliability and accuracy of glycemic monitoring devices. The adoption of emerging technologies and their effective integration into care plans can significantly improve health outcomes for patients with diabetes.

In addition, the research emphasized the relevance of living conditions and the physical environment in glycemic control, suggesting that care strategies should consider the patient's life context. Comfortable and safe environments are essential for glycemic stability, especially in vulnerable populations such as the elderly. Therefore, the results of this study point to a future path that requires a paradigmatic shift in healthcare for hospitalized diabetes patients. Patient-centered healthcare systems, which integrate multidisciplinary care and consider all aspects of the patient's life and well-being, are key to advancing effective diabetes management in hospital settings. The challenge for healthcare professionals, researchers and policymakers is therefore to work together to create care environments that are truly integrative and holistic. Adopting such a comprehensive approach will not only improve clinical outcomes for diabetic patients but will also contribute to a healthier and more resilient society.

Conflict Of Interest
As the authors of this manuscript, we certify that we have no affiliations with or involvement in any organization or entity with anyfinancial or non-financial interest in the subject matter or materials discussed in the manuscript.

Competing Interests
Note: There are no competing interests.

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