

Recent Advances in Glycemic Management for Hospitalized Diabetic Patients

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Abstract: With the increase in the number of diabetic patients, hospitalized diabetes management has become very important. During hospitalization, diabetic patients are prone to high or low blood glucose levels, which pose significant risks and challenges for treatment and recovery. Therefore, glycemic management of diabetic patients during hospitalization is critical. This article reviews the latest research progress in glycemic management of hospitalized diabetic patients from several aspects, develops individualized treatment plans, and uses various methods to manage and control blood glucose in hospitalized diabetic patients.

Keywords: Diabetes mellitus; Hospitalized patients; Glycemic management

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1. Introduction

With the rising number of diabetic patients worldwide, diabetes has become a global chronic disease, making its management particularly important, especially in hospitalized diabetic patients^[1,2]. These patients undergo a variety of treatments, tests, and procedures, of which glycemic management is critical. However, during hospitalization, patients face challenges such as food intake uncertainty, drug interactions, and psychological stress, which pose many difficulties in glycemic management. Therefore, improving glycemic management in hospitalized diabetic patients is one of the current challenges that healthcare workers need to address. Considering that the number of diabetic patients in China has reached a staggering 116.4 million and the prevalence rate is increasing year by year, there is an urgent need to explore a new diabetes health management model to meet this challenge^[3]. Based on this, this paper aims to summarize the current situation of glycemic abnormalities in hospitalized patients, analyze the clinical studies on glycemic management in different patients, and examine existing glycemic management modes, to achieve scientific and effective personalized glycemic management in hospitalized patients and to ensure patient safety.

2. Current status of glycemic management in hospitalized diabetic patients

Many patients suffer from hyperglycemia during hospitalization and may even experience alternating high and low blood glucose levels, possibly due to the severity of their condition or irrational treatment regimens. These problems can prolong the patient's hospitalization, increase treatment costs, and elevate the risk of complications. Hyperglycemia may cause complications such as infection, pneumonia, and renal dysfunction, while hypoglycemia may lead to fainting, convulsions, and even death. Therefore, it is necessary to study and promote effective management strategies to improve glycemic control in hospitalized diabetic patients.

The current inpatient glycemic management models in China are divided into three main categories: (1) departmental self-management model; (2) consultative professional management model; and (3) Internet system management model^[4]. To address the problems of uncertain food intake during hospitalization, drug interactions that may cause blood glucose fluctuations, and psychological stress affecting glycemic control, individualized treatment plans need to be formulated. These plans should include glycemic control protocols, electronic record-keeping, and other technological means. Additionally, nutritional therapy is an important aspect of glycemic management, with low-calorie and high-protein diets contributing to improved glycemic control. Oral supplements of some diabetes-related nutrients and ingredients may also help improve glycemic control.

Future research directions include further optimizing blood glucose management strategies, enhancing medical support and education, and providing more comprehensive care. With advanced technological tools, such as artificial intelligence and big data analytics, blood glucose changes and individualized treatment plans can be more accurately predicted. Strengthening multidisciplinary cooperation and teamwork to provide comprehensive treatment is also a key direction for future development.

In conclusion, there are challenges in the current status of glycemic management in hospitalized diabetic patients. However, through the development of individualized treatment plans, nutritional therapy, and the use of technological means, it is possible to improve glycemic control, reduce the occurrence of complications, improve treatment effectiveness, and promote patient recovery. Future studies should further explore and improve glycemic management strategies to enhance the quality of life for hospitalized diabetic patients. For example, one study confirmed that using a glycemic control protocol during hospitalization significantly reduced blood glucose levels, healthcare costs, and length of stay in hospitalized diabetic patients. Additionally, technological tools such as electronic records allow for better tracking of glycemic changes in hospitalized diabetic patients and timely interventions. Nutritional therapy is also an important aspect of glycemic management for hospitalized diabetic patients. Studies have shown that a low-calorie and high-protein diet can significantly improve glycemic control in hospitalized diabetic patients. Furthermore, using oral supplements of diabetes-related nutrients and ingredients, such as chromium, bitter melon, and vitamin D, can improve glycemic control levels in hospitalized diabetic patients.

In summary, glycemic management of hospitalized diabetic patients is a complex and important task. Developing glycemic control protocols, adopting technological tools such as electronic record-keeping, utilizing nutritional therapy, and providing comprehensive medical support and education can effectively improve glycemic control in hospitalized diabetic patients, reduce the occurrence of complications, improve therapeutic efficacy, and promote patient recovery.

3. Implementation strategy of glycemic management for hospitalized diabetic patients

In recent years, the number of hospitalized diabetic patients has been increasing steadily, and blood glucose

management has become an essential part of their treatment process that cannot be ignored ^[5]. In implementing glycemic management for hospitalized diabetic patients, a series of scientific and standardized strategies and guidelines need to be adopted to achieve effective management.

3.1. Implementation strategies

According to the 9th edition of the Diabetes Map statistics published by the National Diabetes Federation, the prevalence of diagnosed and undiagnosed diabetes was estimated to be 9.3% (463 million people) in 2019 and is projected to rise to 10.2% (578 million people) by 2030 and 10.9% (700 million people) by 2045 ^[6]. These data indicate that diabetes has become a global health challenge, necessitating effective measures for management and public awareness.

- (1) Multidisciplinary collaboration: Glucose management in hospitalized diabetic patients requires collaboration among various professionals, including doctors, nurses, dietitians, etc., to develop a suitable glucose management plan.
- (2) Setting glucose targets: Appropriate glucose targets need to be set to reduce the patient's risk of hyperglycemia and avoid hypoglycemia.
- (3) Close monitoring: The patient's condition should be closely monitored, and the treatment plan and drug dosage should be adjusted promptly to maintain stable blood glucose levels.
- (4) Individualized treatment: Customized blood glucose management plans should be developed based on each patient's age, condition, physical status, and other factors to ensure optimal therapeutic outcomes.

3.2. Guidelines

Effective diabetes treatment requires multidisciplinary cooperation, including endocrinologists, nurses, dietitians, and psychologists. Even in non-endocrinology wards, patients should receive specialized diabetes care, including glucose monitoring, medication adjustments, and complication management to ensure treatment quality and patient safety, which is essential for improving outcomes and quality of life ^[7].

- (1) Glycemic control guidelines: Refer to guidelines such as those from the American Diabetes Association and the International Diabetes Federation to make informed treatment decisions.
- (2) Drug use guidelines: Follow treatment guidelines issued by authoritative organizations for rational drug selection and use.
- (3) Nutritional management guidelines: Arrange patient diets based on professional nutritional management guidelines to ensure balanced and healthy nutrition.

3.3. Difficulties and challenges faced

There are several difficulties and challenges in implementing blood glucose management for hospitalized diabetic patients:

- (1) Insufficient multidisciplinary collaboration: Lack of collaboration among healthcare professionals can prevent achieving the maximum therapeutic effect.
- (2) Insufficient blood glucose monitoring: Inadequate frequency or inappropriate methods of blood glucose monitoring can lead to fluctuations, affecting therapeutic outcomes.
- (3) Insufficient patient self-management: A lack of patient self-control and self-management abilities can complicate blood glucose control.

In conclusion, blood glucose management for hospitalized diabetic patients is a comprehensive issue that requires considering the actual situation of patients to formulate a suitable treatment plan and management guidelines. Strengthening medical collaboration and enhancing patient education are essential to overcoming

the existing difficulties and challenges, ensuring the best therapeutic outcomes.

4. Effectiveness, influencing factors, and impact of glycemic management in hospitalized diabetic patients

In recent years, diabetes has become one of the globally recognized chronic metabolic diseases that pose a serious threat to human health, making the therapeutic management of hospitalized diabetic patients particularly important. During hospitalization, patients need to receive medication, insulin injections, dietary control, and other measures to control blood glucose levels to avoid complications and accelerate the recovery process. The effects and influencing factors of glycemic management in hospitalized diabetic patients have garnered widespread concern in recent years.

4.1. Effectiveness and influencing factors of glucose management in hospitalized diabetic patients

The effects and influencing factors of glycemic management in hospitalized diabetic patients are complex, including the severity of the disease, patient age, disease duration, comorbidities, and treatment measures. Many studies have shown that the severity of the disease is one of the key factors affecting the effectiveness of glycemic management in hospitalized diabetic patients ^[8,9]. Severe diabetic patients often need more active and effective management measures to control blood glucose. Treatment measures for hospitalized patients are usually more standardized than those in outpatient clinics, and with close monitoring by healthcare personnel, the effect of glycemic control during hospitalization is relatively better. Additionally, patients' comorbidities are also important factors affecting the effectiveness of glycemic management during hospitalization. For example, patients with hypertension, hyperlipidemia, cardiovascular disease, and other comorbidities will face increased difficulty and complexity in treatment. Age and disease duration also impact the effect of glycemic management in hospitalized diabetic patients; patients with longer disease duration and older age will experience increased treatment difficulty due to the decline in body functions.

4.2. Impact of glycemic management on efficacy, complications, hospitalization time, and cost

Studies on glycemic management in hospitalized diabetic patients have shown that it significantly impacts outcomes, complications, length of hospital stay, and costs ^[10-12]. Firstly, effective glucose management directly affects the outcome of diabetes treatment. Strengthening blood glucose management during hospitalization can help control patients' blood glucose levels, reduce the risk of complications, and improve treatment efficacy. Secondly, the risk of complications in hospitalized diabetic patients is relatively high, and effective blood glucose management can prevent various complications and further enhance treatment outcomes. Additionally, hospitalization time and costs for diabetic patients are closely related to blood glucose management. Proper blood glucose management can reduce hospitalization time, shorten recovery time, and lower costs, while improper management can increase both the duration and cost of hospitalization due to high or low blood glucose levels.

4.3. Factors affecting glycemic management in hospitalized diabetic patients

To improve the status quo in the care of diabetic patients in China, where there is often more focus on knowledge dissemination than behavioral change, it is essential to emphasize changing patients' out-of-hospital behavioral patterns ^[4]. This includes promoting patients' active participation in self-management programs,

such as dietary control, medication adherence, and exercise; providing effective health education and behavioral interventions to help patients develop healthy habits; and establishing a support system, including family and community support, to promote patients' mental health and self-management abilities. Through these measures, the health management of diabetic patients can be promoted more comprehensively to improve treatment outcomes and quality of life.

Overall, glycemic management of hospitalized diabetic patients has a significant impact on outcomes, complications, length of stay, and costs. Strengthening the training and management of healthcare personnel, improving their medical expertise, and providing reasonable and standardized management of medication use, dietary control, and exercise can effectively improve glycemic management in hospitalized diabetic patients and increase the success rate of treatment.

5. Technologies and methods for glycemic management of hospitalized diabetic patients

With continuous advancements in science and technology, new methods for managing blood glucose in hospitalized diabetic patients are emerging. These innovations can help doctors better manage patients' blood glucose levels, improve treatment outcomes, reduce patient discomfort, and enhance the quality of life.

5.1. New technologies and methods for glycemic management for hospitalized diabetic patients

- (1) Real-time monitoring technology: This technology is based on continuous blood glucose monitoring systems. It allows doctors to understand patients' blood glucose levels in real-time, including fluctuations and trends, enabling better adjustments and treatment decisions.
- (2) Mobile medical technology: Based on mobile internet, this technology uses smartphones and other mobile devices to enable real-time communication between patients and doctors. It facilitates sharing information about blood glucose levels, medication records, diet, etc., improving blood glucose management and treatment.
- (3) Artificial intelligence (AI) technology: AI utilizes big data and machine learning algorithms to analyze vast amounts of patient data and medical information. It provides doctors with more accurate diagnosis and treatment recommendations and assists patients in personalized blood glucose management and health education.

5.2. Prospect and practice of new technologies in glycemic management of hospitalized diabetic patients

- (1) Application prospect of mobile medical technology: This technology has a broad application prospect. It allows real-time interaction between patients and doctors, sharing condition information for better blood glucose management and treatment. Additionally, it enhances the patient experience by reducing pain and burden.
- (2) Application practice of real-time monitoring technology: This technology is widely used. It helps doctors better understand patients' blood glucose levels, allowing for improved adjustment and treatment. It also aids patients in managing their blood glucose, enhancing their quality of life.
- (3) Application prospect of AI technology: AI has wide-ranging applications. By analyzing extensive patient data and medical information, AI can provide more accurate diagnosis and treatment recommendations and assist in personalized blood glucose management and health education. In the

future, AI is expected to become a crucial tool in blood glucose management for hospitalized diabetic patients.

5.3. Advantages and shortcomings of new technologies and methods for glyceemic management in hospitalized diabetic patients

New technologies and methods offer several advantages for blood glucose management in hospitalized diabetic patients. They improve doctors' diagnostic and treatment capabilities, reduce patient discomfort and burden, enhance self-management and monitoring of blood glucose, improve quality of life, increase healthcare efficiency, reduce costs, and save medical expenses. However, there are some shortcomings:

- (1) Technical challenges: The use of these technologies requires a certain level of skill and experience, which some doctors and patients may find challenging.
- (2) Economic constraints: Implementing these technologies requires significant equipment and capital investment, which may be prohibitive for some hospitals and patients.
- (3) Regulatory support: The application of new technologies requires recognition and support from regulatory authorities. A lack of policy and regulatory protection may hinder their promotion and application.

In summary, while new technologies and methods hold great promise for glyceemic management in hospitalized diabetic patients, continuous exploration and innovation are needed. With sustained efforts, these advancements can provide patients with better healthcare services and inject new vitality into the healthcare industry.

6. Summary and prospects

Glyceemic management of hospitalized diabetic patients has received increasing attention in recent years as the number of hospitalized diabetic patients has increased. Poor glyceemic control can lead to problems such as nosocomial infections, prolonged hospitalization, increased costs, and increased mortality; therefore, accurate management of blood glucose levels is critical. Currently, research has made some progress, and good results have been achieved by intervening with patients through oral medication, insulin, and dietary control. Meanwhile, some hospitals have established specialized diabetes teams to manage patients holistically and promote blood glucose control. Despite these achievements, problems still exist. Doctors often have insufficient knowledge of hospitalized diabetic patients, lack attention to blood glucose management, and may ignore patients' needs. Additionally, there is a lack of scientific guidelines and norms, which can easily lead to unstable treatment outcomes. Interdisciplinary collaboration is also not mature enough, affecting the realization of holistic management. Future trends and challenges include personalized and precise glyceemic management, increased interdisciplinary collaboration, and the importance of patient education. Personalized treatment will focus more on individual differences, interdisciplinary cooperation will bring together experts in various fields to serve patients, and patient education will enhance patients' knowledge and self-management of the disease and glyceemic management through publicity and education.

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References

- [1] Guo J, Zhang H, 2023, Serum Amyloid in Type 2 Diabetes Mellitus A, 25(OH) Expression of D₃ and Its Clinical Value Analysis. *Diabetes New World*, 2023,226(19):59-63.
- [2] Yu D, Liu S, Wei A, et al., 2024, Markov-Based Model of Glucagon-Like Peptide 1 Receptor Agonists Combined with Metformin for the Economic Evaluation of Type 2 Diabetes Drugs. *Journal of Pharmaceutical Epidemiology*, 33(4): 388–401.
- [3] International Diabetes Federation, 2019, *IDF Diabetes Atlas 2019*.
- [4] Chinese Physicians Association of Endocrinology and Metabolism Physicians Branch, China Expert Group on Glucose Management in Hospitalized Patients, 2017, *Expert Consensus on Glycemic Management of Hospitalized Patients in China*. *Chinese Journal of Endocrinology and Metabolism*, 33(1): 1–10.
- [5] Xie J, Chen J, Song J, et al., 2017, Retrospective Analysis of Sugar Metabolism in 1726 Hospitalized Patients. *Journal of the Second Military Medical University*, 38(1): 34–40.
- [6] Saeedi P, Petersohn I, Salpea P, et al., 2019, Global and Regional Diabetes Prevalence Estimates for 2019 and Projections for 2030 and 2045: Results from the International Diabetes Federation Diabetes Atlas. *Diabetes Res Clin Pract*, 157: 107843. <https://doi.org/10.1016/j.diabres.2019.107843>
- [7] Zhou X, Yang H, Li LM, et al., 2019, Application of Liaison Nurses in the Homogenization of Hospital Diabetes Care. *Nursing Research*, 33(23): 4132–4134.
- [8] Feng Y, Hong J, Wang Q, et al., 2021, Research Progress on Blood Glucose Management in Patients with Diabetic Foot. *Chinese Journal of Trauma and Repair (Electronic Edition)*, 16(5): 445–448.
- [9] Zhang J, 2020, Study on the Correlation between Short-Term Glucose Fluctuations and Bone Metabolic Markers in Patients with Type 2 Diabetes, thesis, Yan'an University.
- [10] Zhang L, Yang Q, Huang X, et al., 2020, Hospital Informatized Blood Glucose Management: Application in the Perioperative Period of Type 2 Diabetics. *Tianjin Care*, 28(5): 509–513.
- [11] Liu Y, 2020, Application of Informatization Management in Patients with Type 2 Diabetes in Hospital. *Nursing Practice and Research*, 17(12): 65–67.
- [12] Yin J, Liu M, Sun L, et al., 2019, Application of Multidisciplinary Collaborative Model in Peripheral Glucose Management in Patients with Non-Endocrine Type 2 Diabetes. *Nursing Study*, 33(24): 4308–4311.

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