

Postprint of Multidisciplinary PDCA Glycemic Management Model in Elderly Patients with Type 2 Diabetes Mellitus

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Abstract

Objective: To explore the application effect of a multidisciplinary PDCA comprehensive blood glucose management model in elderly diabetic patients in non-endocrinology departments. **Methods:** From June to December 2021, 120 diabetic inpatients from non-endocrinology departments were enrolled and randomly assigned to an observation group and a control group, with 60 patients in each group. Both groups received routine nursing care; the control group was treated with insulin pump therapy and ‘Flash’ glucose monitoring, while the observation group additionally implemented a multidisciplinary PDCA comprehensive blood glucose management model. The incidence of hypoglycemia in both groups was observed, and patient satisfaction with nursing care was evaluated. **Results:** The incidence of hypoglycemia in the observation group was lower than that in the control group ($P < 0.05$). Patient satisfaction in the observation group was higher than that in the control group, and the difference was statistically significant ($P < 0.05$). **Conclusion:** Implementing a multidisciplinary PDCA comprehensive blood glucose management model for diabetic inpatients in non-endocrinology departments can effectively reduce hypoglycemia incidence, enhance patient satisfaction with nursing care, and improve nursing service quality.

Full Text

Abstract

Objective To investigate the effect of a multidisciplinary PDCA comprehensive blood glucose management model in elderly diabetic patients in non-endocrinology departments. **Methods** Elderly type 2 diabetic patients hospitalized in non-endocrinology departments were randomly divided into an observation group and a control group, with cases in each group. All patients

received routine nursing care, insulin pump therapy, and Flash Glucose Monitoring. The observation group additionally received multidisciplinary PDCA comprehensive blood glucose management. The incidence of hypoglycemia and patient satisfaction with nursing care were compared between the two groups. **Results** The incidence of hypoglycemia in the observation group was significantly lower than that in the control group ($P < 0.05$). The satisfaction rate in the observation group was higher than that in the control group, with a statistically significant difference ($P < 0.05$). **Conclusion** The multidisciplinary PDCA comprehensive blood glucose management model can effectively reduce the incidence of hypoglycemia in hospitalized diabetic patients in non-endocrinology departments, improve patient satisfaction with nursing care, and promote the improvement of nursing service quality.

Keywords: diabetes mellitus; PDCA; hypoglycemia; blood glucose control; nursing management

Introduction

With the increasing number of diabetic patients in China, not only are endocrinology departments seeing more cases, but non-endocrine departments are also experiencing a rising number of diabetic patients. Hypoglycemia represents one of the most common complications in diabetes treatment and nursing care, significantly impacting patients' physical and mental health and quality of life. Clinical studies have demonstrated that recurrent hypoglycemic episodes increase the risk of abnormal brain function and irreversible brain cell damage, potentially endangering patient safety in severe cases. In the comprehensive care and treatment of chronic diabetic patients, hypoglycemia prevention remains paramount. As specialized clinical staff in the hospital's endocrinology department, we play a leading role in blood glucose monitoring and management for all diabetic patients throughout the hospital. To effectively mitigate the impact of early hypoglycemia in non-endocrine department diabetic patients and improve patient satisfaction with nursing care, this study applied a multidisciplinary PDCA comprehensive blood glucose management model for real-time blood glucose tracking in type 2 diabetic patients in our hospital's non-endocrine departments, achieving satisfactory results.

1. Materials and Methods

1.1 Study Design and Participants

This study enrolled elderly type 2 diabetic patients hospitalized in non-endocrinology departments. Patients were randomly assigned to either an observation group or a control group, with cases in each group. Prior to enrollment, baseline data including sex, age, blood glucose levels upon admission, and hypoglycemic regimens were collected and evaluated. There were no statistically significant differences in basic characteristics such as age,

sex, underlying systemic diseases, or pre-admission blood glucose levels and management methods between the two groups.

Inclusion criteria: Patients with a clinical diagnosis of diabetes meeting the latest national diabetes management technical standards [1]; ability to communicate verbally, with no consciousness or language disorders; voluntary completion of enrollment application and signing of informed consent during hospitalization.

Exclusion criteria: Patients hospitalized in non-endocrine departments for surgery without diagnosed diabetes; patients with acute diabetes complications, critical illness, advanced cancer, or other terminal conditions; comatose, agitated, or non-cooperative patients.

1.2 Intervention Measures

Control group: In addition to routine nursing care, patients received external insulin pump therapy and Flash Glucose Monitoring.

Observation group: Based on the control group interventions, patients additionally received multidisciplinary PDCA comprehensive blood glucose management.

1.2.1 PDCA Cycle Implementation Plan (P): Before enrollment, a hospital-wide multidisciplinary team was established, led by endocrinology specialists with department directors and head nurses serving as supervisors. Each department had at least one liaison nurse. Diabetes specialist nurses trained and assessed the liaison nurses from non-endocrine departments, using insulin pump operation procedures and diabetes patient health education as assessment criteria. All enrolled patients were added to a WeChat group to create a medical-care-patient participation model. To reduce hypoglycemia incidence, endocrinology specialists used the Hypo [2] hypoglycemia risk scoring system (blood glucose <3.9 mmol/L) to evaluate each patient's hypoglycemia risk upon group entry, establishing different glycemetic control targets and plans based on individual patient conditions. The team managed inpatient blood glucose according to this plan, promptly recording and reporting daily blood glucose values and patient conditions. Department liaisons sent patient blood glucose information in real-time within the group, and endocrinology specialist nurses conducted daily rounds and professional health guidance for non-endocrine patients with insulin pumps and Flash Glucose Monitoring to identify and resolve issues promptly. Endocrinology specialists adjusted treatment protocols in real-time based on patient blood glucose data, with Tuesday designated as the team discussion day for comprehensive analysis of patient blood glucose management. The focus was on targeted analysis of patients experiencing hypoglycemia to identify solutions and reduce incidence. Individualized (strict, general, or lenient) blood glucose control targets were established based on patient differences [3]. The blood glucose control targets for non-endocrine department inpatients are shown in Table 1 .

Do (D): Endocrinology specialists first developed basic protocols for diet, exercise, medication, monitoring frequency, and health education frequency based on individual patient conditions. Responsibility nurses in each department then provided individualized guidance.

Diversified health education: During hospitalization, responsibility nurses conducted bedside individualized “one-on-one” health education, distributed health education manuals, held group education sessions weekly, and used a question-and-answer format after class. Patients who answered correctly received prizes to enhance learning motivation. Endocrinology specialists created QR codes for diabetes-related knowledge and hypoglycemia prevention, sending them to the WeChat group for patients to review repeatedly. Hypoglycemia management procedures were posted in ward corridors.

Individualized dietary guidance: Most patients were elderly. The “palm rule” [4] was used for effective guidance. Based on daily caloric needs, individualized food combinations were provided, and specialist nurses converted food portions into familiar items. For example, appropriate carbohydrates: each morning, patients could eat fist-sized portions of staple foods (e.g., one fist of rice or one sweet potato); fruits: one fist-sized portion daily; protein: eggs; vegetables: two handfuls daily; fats: limited to approximately the tip of the thumb (first section), about 5g or the volume of two fingers together. Responsibility nurses emphasized the importance of cooking methods and taught patients to use food scales to determine daily intake, enabling them to prepare suitable meals at home according to personal preferences.

Proper medication guidance: Patients were instructed to take medications on time and in correct doses, with reinforced guidance on dosage, timing, method, and precautions for hypoglycemic drugs. Medication boxes were labeled with prominent color codes (red for “before meals,” yellow for “after meals”), and “medication alarms” were set to ensure compliance. Responsibility nurses closely observed for adverse drug reactions and instructed patients to monitor blood glucose dynamically after medication, reporting any abnormalities immediately. Medical staff adjusted medication dosages based on blood glucose changes.

Appropriate exercise guidance: Specialist nurses tailored suitable exercise programs for each inpatient based on actual health conditions, emphasizing exercising within one’s capacity and progressing gradually to avoid vigorous exercise. Patients were specifically reminded to carry sugary foods when exercising and to stop immediately if hypoglycemia symptoms occurred.

Real-time dynamic blood glucose monitoring: Daily blood glucose data were sent in the management group. When blood glucose was low, specialists adjusted medication dosages promptly. Responsibility nurses assessed and recorded daily diet, medication, and blood glucose conditions. For patients with stable blood glucose control and nighttime glucose <5.6 mmol/L, a cup of milk before bedtime was recommended to prevent nocturnal hypoglycemia.

Targeted psychological care: Weekly mental health education sessions were or-

ganized on Wednesday afternoons with open questions, encouraging peer and patient-staff communication to alleviate anxiety through peer support. Maintaining quiet, clean wards was also emphasized for patient comfort.

Continuity of care: Continuity of health education is crucial in diabetes care [5]. Telephone and WeChat were used regularly to follow up on patient condition changes, blood glucose status, medication use, and psychological status, with family members encouraged to participate in supervision. Patients showing progress received timely praise, and those attending follow-up visits on time were encouraged to improve self-management compliance and effectiveness, achieving comprehensive hypoglycemia prevention.

Check (C): The endocrinology department developed a hypoglycemia symptom checklist. Responsibility nurses in each department collected daily data on hypoglycemia episodes, including occurrence numbers, timing, symptoms, causes, correction time, and duration. All team members conducted weekly data analysis on Tuesdays, proposing corrective measures and implementation plans for unresolved issues. Head nurses summarized, inspected, and supervised the progress of corrective measures.

Act (A): Team members statistically analyzed collected data, summarizing existing problems and effective solutions at weekly Tuesday meetings. Effective solutions continued to be quality-improved, while unresolved or potential issues entered the next PDCA cycle.

1.3 Outcome Measures

After 2 weeks of enrollment and treatment, satisfaction surveys were distributed and blood glucose data were compared between groups. Hypoglycemia incidence was calculated as: (number of diabetic patients experiencing hypoglycemia / total number of hospitalized diabetic patients) \times 100%. Patient satisfaction with treatment was also assessed.

1.4 Statistical Analysis

SPSS software was used for statistical analysis. Measurement data were expressed as mean \pm standard deviation ($\bar{x} \pm s$) and compared between groups using independent samples t-test. Count data were expressed as percentages (%) and analyzed using χ^2 test. The significance level was set at $\alpha = 0.05$.

2. Results

The observation group showed significantly lower fasting plasma glucose (FPG) and 2-hour postprandial blood glucose (2hPBG) compared to the control group ($P < 0.05$). The control group experienced hypoglycemia in cases (%), while the observation group experienced hypoglycemia in cases (%). The hypoglycemia incidence in the observation group was significantly lower than in the control

group ($P < 0.05$). Survey results indicated that the observation group's satisfaction rate was %, significantly higher than the control group's % ($P < 0.05$).

3. Discussion

The multidisciplinary PDCA comprehensive blood glucose management model enables departments to identify difficulties in managing type 2 diabetic patients in non-endocrine clinical settings through targeted research and development of relevant health checklists. By optimizing clinical workflows for hypoglycemia prevention, improving health management education and training content, strengthening team member training and assessment, and implementing convenient emergency nursing measures—such as establishing storage areas near nursing stations with various sugary foods, biscuits, and 15g glucose powder cups for immediate access during hypoglycemia episodes—the model effectively reduces hypoglycemia incidence, improves patient satisfaction, and enhances medical safety.

Yan Yueyan et al. [6] reported that the incidence of psychological problems of varying degrees in diabetic patients was %. For such psychologically distressed patients with severe conditions, nursing staff should conduct early and accurate mental health assessments to implement more effective and targeted early treatment and psychological nursing care. Patients should also be encouraged to develop confidence in overcoming psychological issues and maintain a positive mindset, thereby improving compliance and promoting active cooperation with treatment.

In summary, applying the multidisciplinary PDCA comprehensive blood glucose management model in non-endocrine clinical settings not only helps type 2 diabetic patients achieve stable blood glucose control and reduce hypoglycemia incidence, but also positively impacts self-management compliance and daily quality of life. This model enhances patient satisfaction and promotes the improvement of specialized nursing quality.

Conflict of Interest Statement: The authors declare no conflict of interest.

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