

Implementation and Evaluation of a Clinical Practice Guideline for Hypoglycemia Management in Hospitalized Patients: A Quasi-Experimental Study

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Abstract: Evidence remains limited regarding how a context-adapted hypoglycemia management guideline can be implemented in routine inpatient practice and whether such an implementation can improve care processes and patient outcomes. This quasi-experimental study evaluated the implementation of an adapted clinical practice guideline for hypoglycemia management at a tertiary care hospital in northeast Thailand. The study included a retrospective three-month pre-implementation baseline period (January–March 2024), a one-month nurse training and preparation phase (May 2025), and a three-month post-implementation period (June–August 2025). Participants included 245 hospitalized patients with at least one hypoglycemic episode (pre-implementation, $n = 138$; post-implementation, $n = 107$) and 137 nurses who implemented the guideline. The guideline was adapted from the Diabetes Association of Thailand's 2023 Clinical Practice Guideline to align with the local hospital's resources, care processes, and practice environment. Implementation included structured preparation, dissemination of resource materials, nurse training, guided practice using the guideline manual, competency assessment, and integration into routine clinical care. Effectiveness was evaluated by comparing hypoglycemia-related clinical indicators, appropriateness of management, treatment-related costs, and nurse satisfaction before and after implementation.

Following implementation, the incidence of severe hypoglycemia (blood glucose < 54 mg/dL) significantly decreased from 7.1 to 2.8 episodes per 1,000 patient-days. Mean blood glucose at detection significantly increased from 58.6 to 62.9 mg/dL, indicating earlier recognition. Appropriate hypoglycemia management increased from 7.3% to 47.1%, and overtreatment with excessive carbohydrate decreased from 40.8% to 23.0%. The average cost of hypoglycemia treatment per episode decreased from 8.35 to 4.26 Thai baht (0.25 USD to 0.13 USD). Nurses demonstrated 100% adherence to hypoglycemia surveillance among high-risk patients, and 70.1% reported high satisfaction with the guideline. In conclusion, implementation of the adapted hypoglycemia management guideline improved the quality and safety of inpatient care. Further multicenter studies are needed to evaluate implementation in other hospital settings.

Keywords: Advanced practice nurse, Clinical practice guideline, Diabetes, Hypoglycemia, Implementation research, Management

Received 20 February 2026; Revised 20 April 2026;

Accepted 21 April 2026

Introduction

Hypoglycemia is a frequently encountered complication that may result in serious or even fatal outcomes among hospitalized patients,^{1,2} particularly in patients with diabetes receiving insulin or insulin secretagogues.^{3,4} Inpatient hypoglycemia is associated with increased risks of cardiac arrhythmia, neurological

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injury, prolonged length of hospital stay, higher healthcare costs, and increased mortality.^{5–9} Despite advances in diabetes management, the incidence of hypoglycemia in hospital settings remains substantial, especially in medical wards where patients often present with complex comorbidities, variable nutritional intake, and fluctuating clinical conditions.^{1,10} Early detection and prompt, appropriate management of hypoglycemia are essential to prevent progression to more severe hypoglycemia, which is associated with prolonged hospitalization, greater healthcare costs, and other adverse clinical outcomes.¹

As key members of the healthcare workforce, nurses play a crucial role in identifying patients at risk of hypoglycemia and providing timely management when it occurs. Previous studies have shown that nurses are often the first to detect hypoglycemia, but their knowledge and competence in hypoglycemia management may vary considerably.¹¹ In practice, ideal hypoglycemia practice is often challenged by heavy workloads, variable clinical judgment, non-specific symptoms, and unclear management instructions. Consequently, hypoglycemia care may be inconsistent across nurses and shifts, with treatment often delayed or suboptimal, thereby increasing the risk of recurrent episodes and progression to more severe hypoglycemia and deleterious outcomes.¹² In addition, standard clinical practice guidelines for hypoglycemia management may not be fully tailored to the context of inpatient practice, where nurses must work within specific ward routines, available materials, and local care processes. In Thailand, the standard hypoglycemia management recommendations in the 2023 Clinical Practice Guidelines for Diabetes, developed by the Diabetes Association of Thailand, were intended for broad hypoglycemia care across outpatient and inpatient settings, rather than specifically for inpatient, nurse-led hospital practice.¹³ Moreover, some recommendations, for instance, the suggested carbohydrate sources for mild to moderate hypoglycemia correction, were not fully suitable for an inpatient setting. Therefore, adapting a standard clinical practice guideline

into a hospital-based guideline aligned with local workflows and available resources is essential for improving hypoglycemia management among hospitalized patients. However, evidence remains limited regarding how a context-adapted hospital-based clinical practice guideline can be effectively implemented in routine inpatient practice and whether such implementation can improve both care processes and patient outcomes. Accordingly, this study examined the implementation of an adapted clinical practice guideline within an implementation research framework comprising two phases: Phase 1, adaptation of the existing guideline to the local context; and Phase 2, implementation of the adapted guideline in routine clinical practice. The study also evaluated whether this implementation reduced severe hypoglycemia incidence among hospitalized patients, while improving the appropriateness of hypoglycemia management by nurses, treatment-related resource utilization, and nurse satisfaction with the guideline.

Literature Review and Conceptual Framework

Hypoglycemia in the inpatient setting is defined as a blood glucose concentration of ≤ 70 mg/dL. Based on severity, it is categorized into three levels. Level 1 hypoglycemia corresponds to a glucose level of 54–70 mg/dL, whereas level 2 hypoglycemia is defined as a glucose level below 54 mg/dL and is considered clinically significant, potentially accompanied by neuroglycopenic symptoms. Level 3 hypoglycemia is a severe clinical event marked by impaired mental or physical functioning that requires external assistance for recovery. Given their clinical seriousness, levels 2 and 3 warrant immediate treatment. In addition, timely management of level 1 hypoglycemia is recommended to prevent deterioration into more severe hypoglycemic episodes.¹⁴

Effective hypoglycemia management in hospitalized patients encompasses several critical

components, including early recognition through blood glucose monitoring, prompt and appropriate treatment based on the patient's level of consciousness and ability to ingest carbohydrates, timely reassessment of blood glucose following treatment, identification of precipitating factors, and escalation of care for severe or recurrent hypoglycemia.¹⁵ Nursing responsibilities in this process include detecting early signs and symptoms, confirming hypoglycemia, administering oral carbohydrates or intravenous dextrose in accordance with clinical protocols, monitoring patient responses, repeating treatment as necessary, and communicating with physicians to facilitate appropriate treatment adjustments.^{16,17} Recent standards emphasize the need for a standardized hospital-wide, nurse-initiated hypoglycemia protocol for hospitalized patients.¹⁴ A study by Araque et al. demonstrated that the implementation of clinical practice guidelines for the management of hypoglycemia in critically ill patients with diabetes significantly reduced the incidence of hypoglycemic events.¹⁸ In addition, Shea et al. examined hypoglycemia prevention in critically ill patients through a nurse-led initiative in collaboration with a multidisciplinary team. This approach included root cause analysis (RCA) of hypoglycemic events, management of identified causes, and prevention strategies through standardized insulin administration guidelines. The study reported a reduction in hypoglycemia incidence from 13.14% to 7.23%.¹⁹ Moreover, subsequent evidence indicates that nurse-driven hypoglycemia management protocols can be equally effective across intensive and non-intensive care settings when adherence is high. No significant differences were observed in time to blood glucose recheck, number of interventions required, or proportion of patients achieving normoglycemia within one hour. Notably, more than 80% of patients in both groups returned to normoglycemia within 60 minutes, highlighting the effectiveness of protocol-based, nurse-led hypoglycemia management regardless of care setting.²⁰

Despite the proven efficacy of the aforementioned standardized hypoglycemia management protocols,

evidence from routine clinical practice suggests that the actual delivery of hypoglycemia care by nurses may still vary substantially,¹² underscoring important gaps between local practice and recommended standards of care. In our hospital, a tertiary-care setting in northeastern Thailand, inpatient data revealed a notable number of hypoglycemic events. Laboratory reports documented 3,532 episodes of hypoglycemia between June and December 2023, and 5,212 episodes between January and June 2024, indicating an increasing trend. Furthermore, a study of 30 patients admitted to a semi-critical care unit who experienced hypoglycemia found that 73% had mild, level 1 hypoglycemia, which should have been managed with oral administration of 15 g of carbohydrates according to the standard guideline. However, 53.33% of these patients were treated with intravenous 50% glucose solution, which resulted in higher treatment costs and transient hyperglycemia. This overtreatment increased the likelihood of subsequent insulin administration and, consequently, the risk of recurrent hypoglycemia. Although blood glucose levels should be reassessed 15 minutes after treatment, follow-up at 60 minutes was observed in only 50% of cases. Such practices do not align with standard hypoglycemia management guidelines and may lead to delayed correction if blood glucose levels remain abnormal. A major challenge was that the standard guideline was not well integrated into routine practice and did not fully align with ward-based care processes. Specifically, the recommended 15g carbohydrate source for the correction of mild to moderate hypoglycemia was not readily available in the wards; treatment was often delayed because nurses typically waited for a physician's order; and timely follow-up blood glucose reassessment was insufficiently emphasized. Therefore, adapting a standard clinical practice guideline to the local clinical context was essential for improving hypoglycemia management among hospitalized patients.

An implementation research framework was used to guide the adaptation and implementation of

the clinical practice guideline in this study. In Phase 1: the guideline adaptation phase, the hospital-based clinical practice guideline was adapted from the Clinical Practice Guideline for Diabetes 2023, developed by the Diabetes Association of Thailand, to align with the practice environment in our hospital.¹³ Multidisciplinary stakeholders codesigned an implementation package (such as education resources, work instructions, and decision support) informed by implementation theory.

In Phase 2, the implementation phase, the adapted guideline and related resources were introduced through structured preparation, dissemination of resource materials, nurse training, guided practice using the guideline manual, competency assessment, and integration into routine clinical care, followed by evaluation of both patient and process outcomes.²¹ Within an implementation research framework, evaluation of an adapted guideline includes both clinical and process outcomes. Clinical outcomes reflect patient safety, appropriateness of care, and resource utilization, whereas process outcomes reflect changes in nursing behavior, and the extent to which the guideline is delivered as intended, including implementation-related outcomes such as appropriateness, acceptability, and fidelity.²² In addition, adaptation of a guideline to the local context should take into account barriers and facilitators to use, as well as the workforce, workflow, and available resources, to ensure appropriate contextualization for implementation in local practice.²³

Study Aims and Hypotheses

The aim of this study was to evaluate how the adapted clinical practice guideline could be effectively implemented in routine care within an implementation research framework and to evaluate its effectiveness in improving hypoglycemia management among hospitalized patients. The outcomes of interest included a reduction in the incidence of severe hypoglycemia,

improved appropriateness of hypoglycemia management by nurses, a reduction in unnecessary treatment-related resource utilization, e.g., overtreatment, and acceptable nurse satisfaction with the adapted guideline. We hypothesized that the incidence of severe hypoglycemia among hospitalized patients, with and without diabetes, would be significantly lower after implementation of the adapted clinical practice guideline. We further hypothesized that, following guideline implementation, nurses' management of hypoglycemia would be more accurate in accordance with the recommended management steps, and that healthcare costs related to hypoglycemia treatment would be reduced as a result of decreased overtreatment with unnecessarily intensive management. In addition, nurse-related implementation indicators, including adherence to the adapted guideline and satisfaction with its use, were evaluated descriptively to assess implementation feasibility and acceptability.

Methods

Study Design and Setting: This study was a quasi-experimental implementation study to evaluate the effectiveness of an adapted clinical practice guideline for managing hospitalized patients with hypoglycemia. The study was conducted in both critical and non-critical care wards of a tertiary care hospital in Thailand. The reporting of this study followed the Transparent Reporting of Evaluations with Nonrandomized Designs (TREND) guideline.

Participants: These consisted of two populations: hospitalized patients and registered nurses. The patient population included adult inpatients aged 18 years or older who experienced at least one documented hypoglycemic episode during hospitalization, defined as a physician-diagnosed event with a recorded blood glucose level ≤ 70 mg/dL. Eligible patients were admitted to the male medical ward, female medical ward, semi-critical medical ward, labor room, or ear, nose, and throat (ENT) ward. Patients were excluded if hypoglycemia was attributable to endogenous hyperinsulinemia (e.g., insulinoma) or occurred during

treatment for hyperglycemic emergencies, including diabetic ketoacidosis or hyperosmolar hyperglycemic state. Cases were identified retrospectively from hospital records during the defined study periods; therefore, no prospective screening or enrollment was undertaken. The patient sample was divided into pre-implementation and post-implementation groups based on the timing of the adapted clinical practice guideline's implementation. In accordance with the principles of implementation research, which emphasize real-world clinical conditions, the sample size was determined based on the actual incidence of hypoglycemia observed during the designated study periods, as recommended by Dusitsin et al.²⁴

The nursing population comprised registered nurses working in the participating wards (male and female medical wards, semi-critical medical ward, labor room, and ENT ward) who applied the adapted clinical practice guideline. Eligible nurses were informed about the study and invited to participate voluntarily. A total of 137 nurses were included.

Ethical Considerations: This research project was approved by the Khon Kaen University Human Research Ethics Committee (Approval No. HE 681063). The rights of participants were fully protected throughout the study. Registered nurses who participated were given adequate information, time, and autonomy to decide whether to participate in the research. Agreement or refusal to participate had no impact on the participants. In addition, all data were handled with strict confidentiality, and participants' personal information was securely protected.

Research instruments:

The intervention instrument

The hospital-based clinical practice guideline was adapted and contextualized into a specific workflow aligned with our hospital's resources, care processes, and practice environment. This process included the use of the standard hypoglycemia management recommendations from the Clinical Practice Guideline for Diabetes 2023, developed by the Diabetes Association of Thailand, as the evidence-based

knowledge source,¹³ adaptation of recommendations to the local inpatient context, and consideration of barriers and facilitators to support nurse-led practice. Examples of local adaptation included the following. First, nurses were instructed to closely monitor patients at high risk of hypoglycemia and to perform point-of-care capillary blood glucose testing in patients with symptoms suggestive of hypoglycemia. When hypoglycemia was confirmed, initial treatment could be initiated immediately without waiting for a physician's order. Second, the adapted clinical practice guideline authorized nurses to withhold glucose-lowering medications as a nurse-led action immediately upon confirmation of hypoglycemia. Third, recommended carbohydrate sources for correcting mild to moderate hypoglycemia, such as sweet drinks or milk, are not routinely available on the wards. Therefore, the adapted clinical practice guideline incorporated a prepackaged 12-g sugar preparation, equivalent to 15 g of carbohydrate, which can be dissolved in water and administered immediately. To support implementation, the research team coordinated with the hospital's nutrition service to develop this preparation as a stocked hospital item, so it could be easily requisitioned, stored for prolonged use, and kept readily available in the ward for standby. These examples illustrate how the standard guideline was adapted to fit the hospital's local context and operational resources (See **Appendix A1**).

The adapted clinical guideline was reviewed by a panel of five experts for content validity and congruence with the study objectives. Based on their recommendations, revisions were made to improve the guideline's clarity and appropriateness. The content validity index (CVI) was 0.81. The finalized guideline was formally approved by the hospital director prior to implementation.

Data Collection Tools:

A Patient's Related Data and Clinical Outcomes

Record Form: A case record form was developed to extract demographic and clinical data from patients' medical records. The collected information included sex, age, admission diagnosis, diabetes diagnosis,

comorbidities, body weight, height, use of medications affecting blood glucose levels, blood glucose monitoring results, documented hypoglycemic blood glucose levels, signs and symptoms of hypoglycemia, management provided during hypoglycemic episodes, and whether follow-up blood glucose measurement was performed. Severe hypoglycemia was defined by blood glucose < 54 mg/dL. Treatment-related costs were calculated using the actual unit prices of hypoglycemia treatments used in the hospital. These included 50% glucose injection 50 mL (19 baht [0.57 USD]/unit), locally prepackaged sugar preparation providing 12 g glucose or 15 g carbohydrate (0.35 baht [0.01 USD]/preparation), milk 120 mL (10 baht [0.30 USD]), and concentrated sweet syrup diluted with water (2.75 baht [0.08 USD]/preparation). The record form underwent expert review by five specialists, yielding item-objective congruence indices ranging from 0.75 to 1.00, with a mean score of 0.93.

The Nurses' Knowledge Regarding Hypoglycemia Management Questionnaire is a 10-item multiple-choice questionnaire with four response options per item. The questionnaire was reviewed by five experts for content validity, resulting in item-objective congruence indices ranging from 0.80 to 1.00 and a mean score of 0.95. Internal consistency reliability of the questionnaire, assessed using the Kuder-Richardson Formula 20 (KR-20), was 0.73. The questionnaire was administered following a hypoglycemia management workshop. Nurses who answered at least 8 out of 10 questions correctly were considered to have met the 80% passing criterion.

The Adherence to Guideline Observation Checklist was developed by the research team. The checklist consisted of five items representing the key components of appropriate hypoglycemia care according to the guideline. An example item is: "When a patient is found to have mild to moderate hypoglycemia, administer 15 g of oral carbohydrate immediately, provided the patient is able to take it

by mouth and is not NPO." Each item was rated dichotomously as performed or not performed. Content validity evaluation by five experts yielded item-objective congruence indices ranging from 0.60 to 1.00, with a mean score of 0.98.

A structured interview form on *Nurses' Satisfaction with the Hypoglycemia Management Guideline* assessed five items: ease of implementation, appropriateness for implementation, cost-effectiveness, improvement in the quality of patient care, and overall satisfaction. Each item was rated on a 3-point scale, indicating high, moderate, or low satisfaction. Content validity was established by five experts, with item-objective congruence indices (CVI) ranging from 0.80 to 1.00 and a mean score of 0.96.

Research procedures

The research was conducted in accordance with following steps.

Phase 1: Adaptation of clinical practice guideline

The adapted clinical practice guideline was developed through a series of meetings among the research team, including all co-authors, to review the standard hypoglycemia management recommendations in the Thai Clinical Practice Guideline for Diabetes 2023 and identify areas that were not fully compatible with the local inpatient context. During these meetings, the team discussed practical limitations in routine ward care. For example, the standard guideline recommended carbohydrate sources that were not routinely available in the wards. Existing local practice also lacked standardization, as some wards prepared sweet drinks independently using commercially available syrup, resulting in variable carbohydrate concentrations and inconsistent treatment. In addition, the team identified delays in management related to waiting for a physician's response in some cases. Based on these discussions, the research team adapted the guideline to align with the nurse-led inpatient workflow, available ward resources, and hospital care processes. The adaptation included recommendations for risk surveillance, nurse-initiated prompt management, withholding

ongoing glucose-lowering therapies when hypoglycemia was confirmed, and use of a standardized locally developed carbohydrate source for correction of mild to moderate hypoglycemia.

Phase 2: Implementation of the adapted guideline

The preparatory phase, which lasted two weeks, included meetings between the researchers and the ward managers to obtain permission and institutional support for implementing the adapted guideline. The researchers, particularly the leading advanced practice nurse (APN) who played a central role in coordinating the guideline implementation, together with an endocrinologist, also met with the nursing staff responsible for caring for patients with hypoglycemia to present the study details, explain the objectives and key components of the guideline, outline the implementation procedures, and obtain their cooperation. These activities were conducted through small-group meetings, during which potential participants were given adequate time and freedom to decide whether to provide informed consent. In addition, a working group was established to promote continuity and consistency in guideline implementation. Guideline materials were prepared and disseminated in both full and abbreviated formats to enhance accessibility and ease of use. The abbreviated materials included infographics, posters, and ward-based information boards designed to support awareness and day-to-day use of the guideline (See Appendix A2).

The official nurse training phase was conducted over a one-month period (May 2025). The leading nurse assembled an implementation team comprising herself, an endocrinologist consultant, and resource persons to organize hands-on workshops aimed at enhancing nurses' skills in hypoglycemia management. The training sessions included guided practice using the guideline manual and were structured as part of a nursing competency development program. Each training session lasted approximately one hour, and three sessions were offered to allow nurses to attend at a time convenient to their work schedules. Each nurse

participant attended one session. Following the training, nurses' knowledge of hypoglycemia management was assessed, with a passing criterion set at a minimum score of 80%. Nurses who did not meet the passing criterion received additional explanation and were reassessed until they achieved the required score within the first week after the training session and before entering the implementation phase.

Data Collection: Patient data were collected from two periods: the retrospective three-month pre-implementation period, before the nurse training phase, and the three-month post-implementation period, after completion of the training and during active use of the guideline. Eligible patients in both periods were identified from the hospital electronic medical record (EMR) by screening laboratory records for blood glucose values that met the criteria for hypoglycemia in the selected wards. In our hospital, point-of-care capillary blood glucose results are recorded in the laboratory information system, allowing systematic identification of cases. The medical records of all eligible patients were then reviewed in detail one week after discharge to collect data on patient characteristics, hypoglycemic episodes, and management practices. Additional data were collected from nurses using a satisfaction interview questionnaire regarding their experience with the guideline.

Adherence to the hypoglycemia management guideline was assessed through direct observation using a structured observation checklist. The observations were conducted by nurse supervisors using predefined assessment criteria. To promote consistency, all observers were oriented to the observation procedures and applied the same criteria across all assessments. Formal inter-rater reliability testing was not performed. To minimize disruption to routine practice and reduce the psychological impact on participants, observations were carried out by nurse supervisors who were not members of the research team. This approach enabled nurses to perform their duties under usual clinical conditions and allowed evaluation of the practicality and feasibility of guideline adherence in routine care.

Data Analysis: Data were analyzed using descriptive statistical methods, including frequencies and percentages for categorical variables, and means with standard deviations or medians with interquartile ranges for continuous variables, as appropriate. Group comparisons between the pre- and post-implementation periods were undertaken using the chi-square test or Fisher's exact test for categorical data, and either the independent t-test or Mann-Whitney U test for continuous data based on distributional assumptions. R software was used for all statistical analyses.

Results

Participant characteristics

A total of 245 patients who experienced hypoglycemia were included in the study. Of these, 138

patients were admitted during the pre-implementation period and 107 during the post-implementation period (**Table 1**). In the pre-implementation group, 43.5% of patients were male, and 56.5% were female, with a mean age of 66.3 years. Type 1 or type 2 diabetes mellitus was present in 62.3% of patients. Chronic kidney disease was observed in 34.8%, and heart failure in 12.3%. The mean body mass index (BMI) was 21.5 kg/m². Insulin therapy was used in 65.9% of patients, while 5.8% received oral glucose-lowering agents. In the post-implementation group, 40.2% of patients were male, and 59.8% were female, with a mean age of 61.5 years. Type 1 or type 2 diabetes mellitus was present in 46.7% of patients, chronic kidney disease in 37.4%, and heart failure in 10.0%. The mean BMI was 22.2 kg/m², and 53.3% of patients were treated with insulin.

Table 1. Baseline characteristics of patients who experienced hypoglycemia in the study

Baseline characteristics	Pre-implementation (n = 138)	Post-implementation (n = 107)	p-value
Age (years), mean (SD)	66.3 (15.4)	61.5 (18.7)	0.027
Sex			
Female (%)	78 (56.5)	64 (59.8)	0.699
Male (%)	60 (43.5)	43 (40.2)	
Ward			
Male medical ward (%)	39 (28.3)	29 (27.1)	0.001
Semi-critical ward (%)	37 (26.8)	23 (21.5)	
Female medical ward (%)	40 (29.0)	35 (32.7)	
Ear-nose-throat ward (%)	19 (13.8)	5 (4.7)	
Labor room (%)	3 (2.2)	15 (14.0)	
Underlying disease			
T1D/T2D (%)	86 (62.3)	50 (46.7)	0.021
GDM (%)	3 (2.2)	12 (11.2)	0.008
Renal failure (%)	48 (34.8)	40 (37.4)	0.774
Cirrhosis (%)	11 (8.0)	5 (4.7)	0.438
CHF (%)	17 (12.3)	10 (9.3)	0.596
Sepsis (%)	7 (5.1)	3 (2.8)	0.572
Weight (kg), mean (SD)	53.9 (12.7)	57.0 (14.7)	0.084
Height (cm), mean (SD)	157.6 (8.1)	158.4 (7.5)	0.441
BMI (kg/m ²), mean (SD)	21.5 (4.1)	22.2 (5.2)	0.266
Insulin use (%)	91 (65.9)	57 (53.3)	0.060
Oral hypoglycemic drug (%)	8 (5.8)	0 (0.0)	0.030

Note. SD = standard deviation, BMI = body mass index, T1D = type 1 diabetes mellitus, T2D = type 2 diabetes mellitus, GDM = gestational diabetes mellitus, CHF = congestive heart failure, kg = kilogram, cm = centimeter, m = meter

The nursing sample comprised 137 nurses working in the participating wards. All nurses completed a hypoglycemia management workshop and were assessed using a knowledge evaluation tool. All participants achieved a passing score before entering the post-implementation period.

Hypoglycemia incidence

The overall incidence of hypoglycemia per 1,000 patient-days slightly decreased following guideline implementation, from 26.4 episodes in the pre-implementation period to 25.2 episodes in

the post-implementation period; however, this difference was not statistically significant. When stratified by severity, the incidence of severe hypoglycemia (blood glucose < 54 mg/dL) decreased significantly from 7.1 to 2.8 episodes per 1,000 patient-days ($p < 0.001$). In contrast, the incidence of mild-to-moderate hypoglycemia (capillary blood glucose 54–70 mg/dL) increased from 19.2 to 22.5 episodes per 1,000 patient-days, although this increase was not statistically significant (**Table 2**).

Table 2. Incidence of hypoglycemia during the study period

Hypoglycemia	Pre-implementation (8,264 patient-days)	Post-implementation (7,527 patient-days)	p-value
Overall hypoglycemia			0.730
Number of episodes (n)	218	190	
Incidence rate (per 1,000 patient-days)	26.4	25.2	
Mild to moderate hypoglycemia (blood glucose 54–70 mg/dL)			0.170
Number of episodes (n)	159	169	
Incidence rate (per 1,000 patient-days)	19.2	22.5	
Severe hypoglycemia (blood glucose < 54 mg/dL)			< 0.001
Number of episodes (n)	59	21	
Incidence rate (per 1,000 patient-days)	7.1	2.8	

Hypoglycemia management

Mean blood glucose levels at the time of hypoglycemia were significantly lower in the pre-implementation group compared with the post-implementation group (58.6 vs 62.9 mg/dL, $p < 0.001$). The mean time from recognition of hypoglycemia to treatment decreased from 8.2 minutes to 4.3 minutes ($p < 0.001$). The mean time from treatment to repeat blood glucose measurement decreased from 34.8 minutes to 13.8 minutes ($p < 0.001$). The proportion of cases with delayed reassessment beyond 15 minutes or without a follow-up blood glucose measurement after treatment decreased

markedly from 81.6% to 35.6% ($p < 0.001$). The proportion of appropriate hypoglycemia management, defined as correct carbohydrate type and dose, and timely reassessment, increased significantly from 7.3% before implementation to 47.1% after implementation ($p < 0.001$). Overtreatment with excessive carbohydrate doses decreased from 40.8% to 23.0%, while undertreatment decreased from 26.6% to 21.5% ($p < 0.001$). The mean cost of hypoglycemia treatment per episode was significantly reduced from 8.35 THB to 4.26 THB (0.25 USD to 0.13 USD) ($p < 0.001$) (**Table 3**).

Table 3. Characteristics of hypoglycemia management

Characteristics of hypoglycemia management	Pre-implementation (n = 218)	Post-implementation (n = 191)	p-value
Capillary blood glucose (CBG), mg/dL			
Mean (SD)	58.6 (10.6)	62.9 (6.7)	< 0.001
Median (IQR)	61 (53, 68)	65 (60, 68)	< 0.001
Time to hypoglycemia treatment (min)			
Mean (SD)	8.2 (8.2)	4.3 (3.1)	< 0.001
Median (IQR)	5 (4, 10)	5 (2, 5)	< 0.001
Time to follow-up blood glucose measurement (min)			
Mean (SD)	34.8 (33.2)	13.8 (13.6)	< 0.001
Median (IQR)	30 (15, 53.8)	15 (7.5, 15)	< 0.001
No follow-up or delayed follow-up, n (%)	178 (81.6)	68 (35.6)	< 0.001
Overall hypoglycemia management (treatment type and follow-up timing)			
Appropriate management, n (%)	16 (7.3)	90 (47.1)	< 0.001
Inappropriate management, n (%)	202 (92.7)	101 (52.9)	
Incorrect type of treatment, n (%)			
Overtreatment	89 (40.8)	44 (23.0)	< 0.001
Undertreatment	58 (26.6)	41 (21.5)	
Cost per hypoglycemic episode (Thai baht)			
Mean (SD)	8.35 (7.98)	4.26 (7.54)	< 0.001
Median (IQR)	2.75 (2.75, 19)	0.35 (0.35, 4.04)	< 0.001
Cost per hypoglycemic episode (USD)			
Mean (SD)	0.25 (0.24)	0.13 (0.22)	< 0.001
Median (IQR)	0.08 (0.08, 0.57)	0.01 (0.01, 0.12)	< 0.001

Note. mg/dL = milligrams per deciliter, SD = standard deviation, IQR = interquartile range, min = minute, USD = United States dollar

Adherence to the hypoglycemia management guideline

Non-participant observation during guideline implementation demonstrated high adherence rates. Monitoring of blood glucose and surveillance for hypoglycemic symptoms were performed in 100% of cases among high-risk patients. Discontinuation of

glucose-lowering medications upon detection of hypoglycemia occurred in 99.5% of cases. Appropriate carbohydrate administration based on the severity of hypoglycemia was observed in 75.5% of cases. Blood glucose reassessment within 15 minutes occurred in 68.1% of cases, and physician notification was performed in 98.4% of cases (**Table 4**).

Table 4. Adherence to the clinical practice guideline for hypoglycemia management

Item	Adherence (%)	Non-adherence (%)
1. Patients at risk of hypoglycemia received capillary blood glucose monitoring and symptom surveillance for hypoglycemia	100.0	0.0
2. When hypoglycemia was detected, glucose-lowering medications were withheld, and patients were provided with oral carbohydrates or intravenous glucose as appropriate	99.5	0.5
3. Patients with mild to moderate hypoglycemia received 15 grams of oral carbohydrates, and patients with severe hypoglycemia received 50 mL of 50% glucose solution	75.5	24.5
4. Follow-up capillary blood glucose measurement was performed 15 minutes after hypoglycemia treatment	68.1	31.9
5. If blood glucose remained ≤ 70 mg/dL after treatment, the physician was notified for further management	98.4	1.6

Note. mg/dL = milligrams per deciliter, mL = milliliter

Nurse satisfaction with the guideline

Overall, nurse satisfaction with the hypoglycemia management guideline was high. Satisfaction with the guideline's ability to enhance the quality of hypoglycemia care was reported at a high level by 78.1% of nurses. Ease of use and practicality were rated highly by 75.2%

of participants, and appropriateness for unit implementation was also rated highly by 75.2%. Cost-saving benefits, including reductions in staff workload, time, and resource utilization, were rated highly by 72.3% of nurses. Overall satisfaction with the guideline was rated at a high level by 70.1% of participants (**Figure 1**).

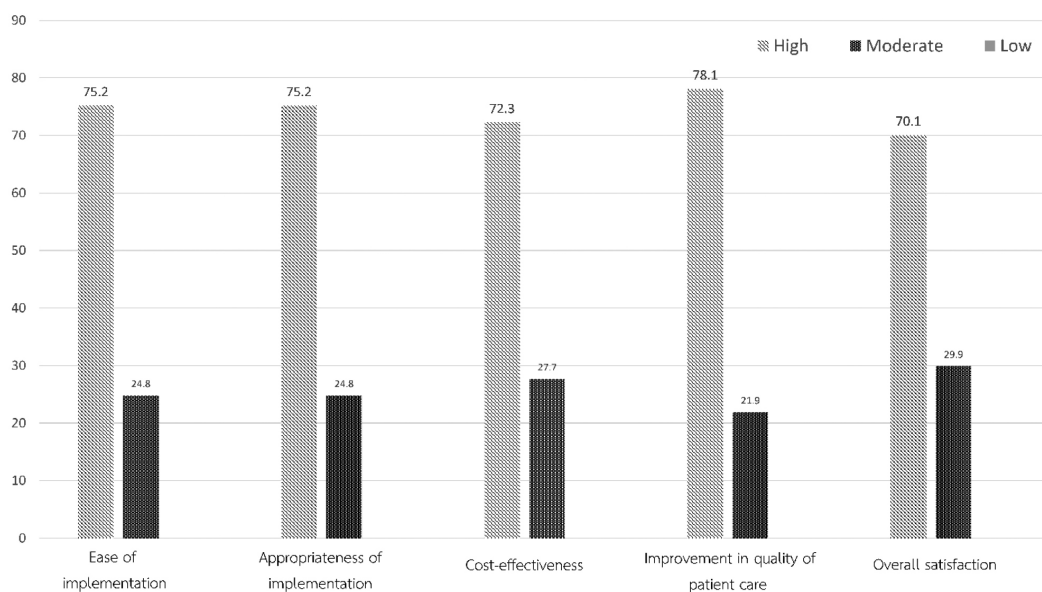


Figure 1. Nurse satisfaction following implementation of the hypoglycemia management clinical practice guideline (reported in percent)

Discussion

The implementation of the hypoglycemia management guideline was associated with improved patient outcomes. Following guideline adoption, the incidence of severe hypoglycemia significantly decreased, indicating that the guideline enhanced early recognition and appropriate management of hypoglycemia among at-risk patients and those with mild hypoglycemia, thereby preventing progression to more severe events. Notably, nursing surveillance for hypoglycemic signs and symptoms among high-risk patients was performed consistently, with 100% adherence. This improvement in monitoring translated into earlier detection of patients with early-stage hypoglycemia. Specifically, the incidence of mild-to-moderate hypoglycemia (capillary blood glucose 54–70 mg/dL) per 1,000 patient-days increased from 19.2 to 22.5, suggesting improved identification of early hypoglycemic episodes. These findings are consistent with those of Araque et al., who demonstrated that implementation of standardized hypoglycemia management protocols significantly reduced hypoglycemic events among critically ill patients with diabetes.¹⁸ Similar results were reported by Meechin and Surit, who found that patients managed according to hypoglycemia care guidelines experienced fewer recurrent hypoglycemic episodes.²⁵

Mean blood glucose levels at the time of hypoglycemia detection significantly increased from 58.6 mg/dL in the pre-implementation period to 62.9 mg/dL following implementation. The observed changes in blood glucose levels during hypoglycemia suggest that the clinical practice guideline facilitated earlier recognition of hypoglycemic events. Earlier identification is likely attributable to more consistent adherence to capillary blood glucose monitoring and heightened symptom surveillance by nurses, as emphasized in the guideline. Recognizing hypoglycemia at a less severe stage may allow for timely intervention before further glucose decline occurs, thereby reducing the risk of progression to severe hypoglycemia.^{1,26} Improvements

were also observed in process-related aspects of care, indicating enhanced efficiency and quality of hypoglycemia management following guideline implementation. Shorter intervals between recognition of hypoglycemia and treatment, as well as more timely follow-up blood glucose reassessment, reflect a more standardized and systematic nursing response. Importantly, the proportion of cases with reassessment delayed by more than 15 minutes or without follow-up blood glucose measurement decreased markedly after implementation. This improvement in timely reassessment reflects improved patient safety, as prompt follow-up is essential for identifying persistent hypoglycemia, guiding further treatment, and reducing the risk of prolonged or recurrent hypoglycemia.^{26–28} Moreover, the substantial increase in appropriate hypoglycemia management highlights the role of clear, structured guidance in supporting correct clinical decision-making. Emphasis on oral administration of an appropriate carbohydrate dose for patients with mild to moderate hypoglycemia aligns with established recommendations. It may help prevent overtreatment, unnecessary intravenous therapy, and avoidable resource utilization.^{13,14}

However, the hypoglycemic outcomes of this study should be interpreted with caution because some baseline characteristics differed between the pre- and post-implementation groups. Although the absolute differences in some variables, such as age, were relatively small and unlikely to have substantially influenced the observed outcomes, residual confounding related to patient characteristics and treatment patterns cannot be excluded. In addition, because our case record form did not specifically classify diabetes type as 1 or 2, the influence of diabetes type on hypoglycemia risk could not be examined in greater detail.

Regarding nursing outcomes, competency-based training significantly enhanced nurses' knowledge and confidence in managing hypoglycemia. Prior to training, most nurses possessed baseline knowledge but lacked confidence in clinical decision-making. Following

the workshop and implementation of a standardized guideline, nurses reported increased confidence in managing hypoglycemia. Ongoing clarification of guideline components, together with supportive supervision, regular feedback, and continuous monitoring, facilitated accurate and consistent application of the guideline. This approach aligns with implementation strategies previously described.²⁹

Nursing practices that demonstrated the highest adherence included monitoring capillary blood glucose and observing symptoms in high-risk patients, discontinuing glucose-lowering medications upon detecting hypoglycemia, and promptly reporting hypoglycemic events to physicians for further management planning. These practices contributed substantially to patient safety and align with findings reporting that nurse-led, multidisciplinary hypoglycemia prevention strategies effectively reduced hypoglycemic events in critically ill patients.¹⁹ Furthermore, appropriate management of hypoglycemia according to severity was consistently observed, reflecting the effectiveness of preparatory measures such as staff readiness, workflow mapping, access to simplified guideline summaries, and structured training programs, as described in prior implementation studies.²⁹

After three months of guideline implementation, nurses reported high levels of satisfaction. They perceived the guideline as practical, easy to use, and effective in improving the quality of patient care. Overall satisfaction with the hypoglycemia management guideline was high, supporting its feasibility, acceptability, and sustainability in routine clinical practice.

Successful implementation of the hospital-based clinical practice guideline likely resulted from several complementary strategies, including adapting the guideline to local workflows and available resources, developing practical implementation materials, staff education and workshops, post-training reinforcement, and support from nurse leaders during routine clinical practice.^{30–32} These implementation processes may also reflect the contribution of APN competencies,

particularly in evidence translation, contextual adaptation, staff support, and coordination of practice change within the clinical setting. Together, these strategies may have contributed to improvements in the timeliness of hypoglycemia treatment, follow-up blood glucose monitoring, and overall management. However, the findings also indicate that further improvement is still needed. Delays in follow-up blood glucose monitoring remained in some cases, and inappropriate management was still observed in a substantial proportion of hypoglycemic episodes. These gaps may reflect the difficulty of achieving fully consistent adherence in routine clinical settings, particularly when repeated treatment and reassessment are required. Continued quality improvement, stronger reinforcement of the guideline, point-of-care reminders for timely reassessment, and future refinement of the guideline protocol may further improve adherence.

Limitations

Several limitations of this study should be acknowledged. First, this study was conducted as implementation research in a real-world clinical setting using a pre-post design; therefore, the observed outcomes should be interpreted in light of contextual, organizational, and practice-related factors that may have influenced implementation and its effects over time. Changes in hypoglycemia incidence and management practices may also have been shaped by temporal trends, variations in patient characteristics, local workflow, and concurrent quality improvement activities occurring during the study period. Second, hypoglycemia-related outcomes and management processes were derived from routinely documented medical records and point-of-care blood glucose data. As with all retrospective data collection, the accuracy and completeness of documentation may have varied, potentially leading to underestimation or misclassification of hypoglycemia episodes and management practices. Third, healthcare cost outcomes were assessed using

proxy indicators for hypoglycemia management rather than through direct cost analysis. Although these proxies reflect resource utilization associated with hypoglycemia care, they may not fully capture the overall economic impact of guideline implementation. Fourth, capillary blood glucose levels after hypoglycemia management were not collected. Consequently, the study was unable to directly assess post-treatment glycemic recovery or provide additional evidence regarding the effect of guideline implementation on patient safety in this aspect. Nevertheless, the study captured significant improvement in follow-up blood glucose reassessment practices, providing indirect evidence of enhanced safety-related management processes after implementation. Finally, adherence to the hypoglycemia management guideline was evaluated through direct observation by different nurse supervisors using a structured observation checklist, but formal inter-rater reliability testing was not performed. Some variation among observers may have persisted, introducing measurement bias in the adherence assessment. Another potential source of bias is the Hawthorne effect. Because adherence to the guideline was assessed through direct observation, nurses may have modified their behavior when they were aware they were being observed. Although the observations were conducted by nurse supervisors who were not members of the research team and took place under routine clinical conditions, this potential bias cannot be excluded.

Conclusions and Implications for

Nursing Practice

This study supports the effectiveness of implementing a clinical practice guideline for managing hypoglycemia in inpatients. The guideline was associated with reduced incidence of severe hypoglycemia, improved hypoglycemia management, and lower treatment-related costs. These findings support the value of context-adapted, APN-led guideline

implementation in routine inpatient care. The implementation process highlighted contributions of the advanced practice nurse to evidence translation, interprofessional collaboration, care coordination, and outcome evaluation. Effective guideline implementation strategies included contextual adaptation of the guideline, practical implementation materials, staff training with reinforcement, and support from nurse supervisors. Continued monitoring of key process outcomes, together with further refinement of the guideline in specific clinical situations, may help sustain improvement in nursing practice.

Acknowledgments

The authors would like to express their sincere appreciation to the patients and nursing staff at Srinagarind Hospital for their cooperation and valuable contributions to this study.

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Data analysis and interpretation: S.C., K.Y.

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All authors reviewed and approved the final version of the manuscript; we agree to be accountable for all aspects of the work.

References

1. Hukower RD, Pollack RM, Zonszein J. Understanding hypoglycemia in hospitalized patients. *Diabetes Manag (Lond)*. 2014;4(2):165–76. doi:10.2217/DMT.13.73.
2. Yeh HF, Chao WC, Wu CL, Chan MC. Hypoglycemia and hospital mortality in critically ill patients. *Sci Rep*. 2025;15(1):2642. doi: 10.1038/s41598-025-87163-9.

3. Pratiwi C, Mokoagow MI, Made Kshanti IA, Soewondo P. The risk factors of inpatient hypoglycemia: a systematic review. *Heliyon*. 2020;6(5):e03913. doi: 10.1016/j.heliyon.2020.e03913.
4. Kuragayala SD, Nayak S, Khatib K. Hypoglycemia in hospitalized patients: a sleeping monster. *Muller J Med Sci Res*. 2024;15(1):5–11. doi: 10.4103/mjmsr.mjmsr_81_23.
5. American Diabetes Association. Standards of medical care in diabetes–2022 abridged for primary care providers. *Clin Diabetes*. 2022;40(1):10–38. doi: 10.2337/cd22-as01.
6. Yun JS, Park YM, Han K, Cha SA, Ahn YB, Ko SH. Severe hypoglycemia and the risk of cardiovascular disease and mortality in type 2 diabetes: a nationwide population-based cohort study. *Cardiovasc Diabetol*. 2019;18(1):103. doi:10.1186/s12933-019-0909-y.
7. Kwan TN, Zwakman–Hessels L, Marhoon N, Robbins R, Mårtensson J, Ekinci E, et al. Relative hypoglycemia in diabetic patients with critical illness. *Crit Care Med*. 2020 Mar;48(3):e233–40. doi: 10.1097/CCM.0000000000004213.
8. ORIGIN Trial Investigators, Mellbin LG, Rydén L, Riddle MC, Probstfield J, Rosenstock J, et al. Does hypoglycaemia increase the risk of cardiovascular events? A report from the ORIGIN trial. *Eur Heart J*. 2013;34(40):3137–44. doi: 10.1093/eurheartj/eh332.
9. Tan HK, Flanagan D. The impact of hypoglycaemia on patients admitted to hospital with medical emergencies. *Diabet Med*. 2013;30(5):574–80. doi: 10.1111/dme.12123.
10. Aggarwal AK, Bajpai RG. A six-month prospective audit of hypoglycemia in non-critically ill inpatients at a tertiary care hospital in north India: prevalence, presentation, and prevention. *Cureus*. 2024;16(11):e74629. doi: 10.7759/cureus.74629.
11. Majić K, Car M. Knowledge and attitudes of Croatian nurses toward hypoglycemia management: a cross-sectional study. *Diabetology*. 2025;6(7):65. doi: 10.3390/diabetology6070065.
12. Coats A, Marshall D. Inpatient hypoglycaemia: a study of nursing management. *Nurs Pract N Z*. 2013;29(2):15–24. PMID: 24187806.
13. The Royal College of Physicians of Thailand; Diabetes Association of Thailand under the Patronage of Her Royal Highness Princess Maha Chakri Sirindhorn; Endocrine Society of Thailand; Department of Medical Services; and National Health Security Office. Clinical practice guidelines for diabetes 2023. Bangkok: Srimuang Printing; 2023.
14. American Diabetes Association Professional Practice Committee for Diabetes. 16. Diabetes care in the hospital: standards of care in diabetes–2026. *Diabetes Care*. 2026;49(Suppl 1):S339–55. doi: 10.2337/dc26-S016.
15. Munoz M, Pronovost P, Dintzis J, Kemmerer T, Wang NY, Chang YT, et al. Implementing and evaluating a multicomponent inpatient diabetes management program: putting research into practice. *Jt Comm J Qual Patient Saf*. 2012;38(5):195–206. doi: 10.1016/s1553-7250(12)38025-2.
16. Stewart M. Recognising and managing hypoglycaemia in adults with diabetes in the emergency department. *Emerg Nurse*. 2025;33(2):35–42. doi: 10.7748/en.2025.e2223.
17. Cohen M, de Grandpre K, Herlihy WM, Cooper L. Initiating an insulin safety campaign to reduce the incidence of glycemic harm events for hospitalized adults 65 and older. *J Am Geriatr Soc*. 2025;73(2):602–11. doi: 10.1111/jgs.19193.
18. Araque KA, Kadayakkara DK, Gigauri N, Sheehan D, Majumdar S, Buller G, et al. Reducing severe hypoglycaemia in hospitalised patients with diabetes: early outcomes of standardised reporting and management. *BMJ Open Qual*. 2018;7(2):e000120. doi: 10.1136/bmjopen-2017-000120.
19. Shea KE, Gerard SO, Krinsley JS. Reducing hypoglycemia in critical care patients using a nurse-driven root cause analysis process. *Crit Care Nurse*. 2019;39(4):29–38. doi: 10.4037/ccn2019876.
20. Robinson A, Mathiason MA, Manchester C, Tracy MF. Evaluation of nurse-driven management of hypoglycemia in critically ill patients. *Am J Crit Care*. 2024;33(3):218–25. doi: 10.4037/ajcc2024320.
21. Curtis K, Fry M, Shaban RZ, Considine J. Translating research findings to clinical nursing practice. *J Clin Nurs*. 2017;26(5–6):862–72. doi: 10.1111/jocn.13586.

22. Proctor E, Silmere H, Raghavan R, Hovmand P, Aarons G, Bunger A, et al. Outcomes for implementation research: conceptual distinctions, measurement challenges, and research agenda. *Adm Policy Ment Health*. 2011;38(2): 65–76. doi: 10.1007/s10488-010-0319-7.
23. Harrison MB, Légaré F, Graham ID, Fervers B. Adapting clinical practice guidelines to local context and assessing barriers to their use. *CMAJ*. 2010;182(2):E78–84. doi: 10.1503/cmaj.081232.
24. Dusitsin N, Onthum Y. Principle and guideline for operations research work. *Thai J Health Res*. 2003;17(2): 99–110. Available from: <https://he01.tci-thaijo.org/index.php/jhealthres/article/view/188014> (in Thai).
25. Meechin N, Surit P. Effects of a nursing practice guideline for diabetic patients hospitalized with hypoglycemia on recurrent hypoglycemia, length of stay and readmission. *J Nurs Health Care*. 2018;36(3):157–65. Available from: <https://he01.tci-thaijo.org/index.php/jnat-ned/article/view/151829> (in Thai).
26. Cryer PE, Davis SN, Shamon H. Hypoglycemia in diabetes. *Diabetes Care*. 2003;26(6):1902–12. doi: 10.2337/diacare.26.6.1902.
27. Maynard GA, Childers D, Holdych J, Kendall H, Hoag T, Harrison K. Improving glycemic control safely in non-critical care patients: a collaborative systems approach in nine hospitals. *Jt Comm J Qual Patient Saf*. 2017;43(4):179–88. doi: 10.1016/j.jcjq.2017.01.003.
28. Saikawa R, Yamada H, Suzuki D, Amamoto M, Matsumoto Y, Funazaki S, et al. Risk factors of hypoglycemic encephalopathy and prolonged hypoglycemia in patients with severe hypoglycemia. *J Clin Med Res*. 2019;11(3):213–8. doi: 10.14740/jocmr3728.
29. Moonthee K, Soivong P, Udomkamsuk W. Effectiveness of implementing clinical practice guidelines in promoting advanced care planning for cancer patients receiving palliative care: an implementation research study. *Chiang Mai Med J*. 2021;60(4):675–93. doi: 10.12982/cmumedj.2021.57.
30. Fontaine G, Vinette B, Weight C, Maheu-Cadotte MA, Lavallée A, Deschênes MF, et al. Effects of implementation strategies on nursing practice and patient outcomes: a comprehensive systematic review and meta-analysis. *Implement Sci*. 2024;19(1):68. doi: 10.1186/s13012-024-01398-0.
31. Huang X, Wang C, Lu L, Chen J, Wang R, Feng Y, et al. The effect of implementation leadership training for nursing informal leaders in the evidence-based practice. *Front Med (Lausanne)*. 2025;12:1631810. doi: 10.3389/fmed.2025.1631810.
32. Xiong B, Stirling C, Bailey DX, Prudon P, Martin-Khan M. Implementation strategies of a national standard for comprehensive care in acute care hospitals: an interview study. *Int J Nurs Sci*. 2025;12(4):369–78. doi: 10.1016/j.ijnss.2025.06.002.

การนำแนวปฏิบัติทางคลินิกสำหรับการดูแลรักษาภาวะน้ำตาลต่ำในเลือดไปใช้ในผู้ป่วยที่รับการรักษาในโรงพยาบาล : การวิจัยกึ่งทดลอง

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บทคัดย่อ : ในปัจจุบันยังมีการศึกษาที่จำกัดเกี่ยวกับการนำแนวปฏิบัติทางคลินิกสำหรับการดูแลรักษาภาวะน้ำตาลต่ำในเลือดไปปรับใช้กับบริบทการดูแลผู้ป่วยที่รับการรักษาในโรงพยาบาล และการนำไปใช้นั้นสามารถปรับปรุงกระบวนการดูแลและผลลัพธ์ของผู้ป่วยได้หรือไม่ การวิจัยกึ่งทดลองนี้มีวัตถุประสงค์เพื่อประเมินการนำแนวปฏิบัติทางคลินิกสำหรับการดูแลรักษาภาวะน้ำตาลต่ำในเลือดที่ปรับให้เหมาะสมกับบริบทของโรงพยาบาลตติยภูมิแห่งหนึ่งในภาคตะวันออกเฉียงเหนือของประเทศไทย การศึกษาประกอบด้วยช่วงข้อมูลพื้นฐานย้อนหลัง 3 เดือนก่อนการนำแนวปฏิบัติไปใช้ (มกราคม-มีนาคม พ.ศ. 2567) ช่วงเตรียมความพร้อมและอบรมพยาบาล 1 เดือน (พฤษภาคม พ.ศ. 2568) และช่วงหลังการนำแนวปฏิบัติไปใช้ 3 เดือน (มิถุนายน-สิงหาคม พ.ศ. 2568) ผู้เข้าร่วมวิจัยประกอบด้วยผู้ป่วยที่รับการรักษาในโรงพยาบาล 245 รายที่มีภาวะน้ำตาลต่ำในเลือดอย่างน้อย 1 ครั้ง (ก่อนการนำแนวปฏิบัติไปใช้ 138 ราย; หลังการนำแนวปฏิบัติไปใช้ 107 ราย) และพยาบาล 137 รายที่นำแนวปฏิบัตินี้ไปใช้ สำหรับแนวปฏิบัติดังกล่าวได้รับการดัดแปลงจากแนวทางเวชปฏิบัติโรคเบาหวานของสมาคมโรคเบาหวานแห่งประเทศไทย พ.ศ. 2566 โดยดัดแปลงให้สอดคล้องกับทรัพยากร กระบวนการดูแล และบริบทการปฏิบัติงานของโรงพยาบาล การนำแนวปฏิบัติไปใช้ประกอบด้วยการเตรียมความพร้อมอย่างเป็นระบบ การเผยแพร่สื่อความรู้ การอบรมพยาบาล การฝึกปฏิบัติโดยใช้คู่มือแนวปฏิบัติ การประเมินสมรรถนะ และการบูรณาการเข้าสู่กระบวนการดูแลรักษาผู้ป่วย การประเมินประสิทธิผลของการนำแนวปฏิบัติไปใช้ทำโดยการเปรียบเทียบตัวชี้วัดทางคลินิกที่เกี่ยวข้องกับภาวะน้ำตาลต่ำในเลือด ความเหมาะสมของการจัดการ ค่าใช้จ่ายที่เกี่ยวข้องกับการรักษา และความพึงพอใจของพยาบาลก่อนและหลังการนำแนวปฏิบัติไปใช้ ภายหลังการนำแนวปฏิบัติไปใช้อุบัติการณ์ของภาวะน้ำตาลต่ำในเลือดระดับรุนแรง (ระดับน้ำตาลในเลือด < 54 มก./ดล.) ลดลงอย่างมีนัยสำคัญจาก 7.1 เป็น 2.8 ครั้งต่อ 1,000 วันนอน ระดับน้ำตาลในเลือดเฉลี่ย ณ เวลาตรวจพบภาวะน้ำตาลต่ำเพิ่มขึ้นอย่างมีนัยสำคัญจาก 58.6 เป็น 62.9 มก./ดล. สะท้อนถึงการตรวจพบที่เร็วขึ้น การจัดการภาวะน้ำตาลต่ำอย่างเหมาะสมเพิ่มขึ้นจากร้อยละ 7.3 เป็นร้อยละ 47.1 และการให้คาร์โบไฮเดรตทางปากเพื่อแก้ไขภาวะน้ำตาลต่ำในเลือดที่เกินความจำเป็นลดลงจากร้อยละ 40.8 เป็นร้อยละ 23.0 ค่าใช้จ่ายเฉลี่ยในการรักษาภาวะน้ำตาลต่ำต่อครั้งลดลงจาก 8.35 บาท เป็น 4.26 บาท พยาบาลมีการปฏิบัติตามแนวทางการเฝ้าระวังภาวะน้ำตาลต่ำในผู้ป่วยกลุ่มเสี่ยงร้อยละ 100 และร้อยละ 70.1 รายงานว่ามีความพึงพอใจต่อแนวปฏิบัติในระดับสูง โดยสรุป การนำแนวปฏิบัติทางคลินิกสำหรับการดูแลรักษาภาวะน้ำตาลต่ำในเลือดที่ปรับให้เหมาะสมกับบริบทไปใช้สามารถช่วยยกระดับคุณภาพและความปลอดภัยของการดูแลผู้ป่วยที่รับการรักษาในโรงพยาบาล โดยควรมีการศึกษาแบบพหุสถาบันเพิ่มเติมเพื่อประเมินการนำแนวปฏิบัตินี้ไปใช้ในบริบทของโรงพยาบาลอื่น

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คำสำคัญ : ผู้ปฏิบัติการพยาบาลขั้นสูง แนวปฏิบัติทางคลินิก เบาหวาน ภาวะน้ำตาลต่ำในเลือด การวิจัยด้านการนำไปใช้ การจัดการ

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