Cogitare Enfermagem

ORIGINAL ARTICLE

NURSING PROTOCOL FOR GLYCEMIC MONITORING IN HOSPITALIZED INDIVIDUALS WITH TYPE 2 DIABETES MELLITUS*

HIGHLIGHTS

1. Nursing care protocol for glycemic monitoring.
2. Role of the nursing team in glycemic monitoring.
3. Tool for nursing care practice.

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ABSTRACT

Objective: Developing a nursing care protocol for glycemic monitoring of hospitalized individuals with Type 2 Diabetes Mellitus. **Method:** Methodological research conducted in 2021 and 2022 in Manaus, state of Amazonas, Brazil, in three phases: 1) Theoretical phase: literature review, consensus search, development of analytical frameworks, content selection. 2) Protocol development phase. 3) Protocol evaluation phase conducted by nurses regarding clarity, relevance, and applicability. **Results:** The literature review yielded 15 articles and five consensus statements from scientific societies. The protocol consists of 11 items, with an emphasis on the identification of risk factors, manifestations of hyperglycemia and hypoglycemia, nursing care, the nursing process, and a flowchart. The nurses' evaluation was favorable, achieving an CVI of 1.0 regarding clarity and relevance, and it was considered applicable. **Conclusion:** The protocol will support nursing care in glycemic monitoring, enabling better glycemic control for hospitalized individuals with diabetes.

DESCRIPTORS: Nursing; Nursing Care; Methodological Research in Nursing; Diabetes Mellitus; Glycemic Control.

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INTRODUCTION

The development of Type 2 Diabetes Mellitus (T2DM) and the lack of control of the condition can lead to acute and chronic complications. Acute complications typically arise from occasional episodes of disease mismanagement. In such cases, early detection of the alteration and intervention are necessary as there are serious consequences, such as hypoglycemic coma[1-2].

The prevalence of individuals with T2DM hospitalized in hospitals is higher when compared to the general population, which can be justified by the relationship between T2DM and cardiovascular, metabolic, and infectious complications that require hospitalization for treatment[1].

The American Diabetes Association (ADA) recommends performing hemoglobin A1c testing in all individuals with a previous diagnosis of DM and in individuals who exhibit hyperglycemia (blood glucose >130 mg/dL) while hospitalized[1]. The Brazilian Diabetes Society (SBD)[2] and the ADA[3] emphasize that a history of glycemic levels with high variability is associated with mortality. For this management, there are medications and practices that should be adopted for the control and prevention of glycemic alterations[4]. Some risk factors for these alterations involve delayed glycemic assessment, organ failure, renal insufficiency, sepsis, use of vasoactive drugs, inadequate handling, or the absence of an institutional protocol[4].

A study on nurses' knowledge regarding diabetes care identified significant deficits in many aspects of the treatment, including knowledge about caring for individuals with diabetes and monitoring blood glucose levels[5]. In addition to this limitation, there is a lack of protocols addressing this care during hospitalization. In this context, the importance of developing care protocols for individuals with glycemic alterations is emphasized as a tool that promotes cooperation, trust, and standardization[3-4].

The nursing team plays a crucial role in glycemic monitoring of hospitalized individuals, often being the first to detect glycemic-related alterations and make initial decisions[1]. This situation highlights the importance of having protocols that support the team in taking necessary actions, based on scientific evidence and tailored to the context in which they operate.

A protocol is an instrument composed of the detailed description of a specific condition of care, serving as a legal tool encompassing procedures and operational details regarding what is done, by whom, and how, guiding decisions in healthcare for the prevention, recovery, or rehabilitation of health[6]. Its use in practice brings about improvement and quality in care, as it presents the best available care options. Protocols also reduce the variation in procedures and information among healthcare team members and establish boundaries for action[7].

Therefore, it is essential for a protocol to adhere to the regulations and standards of the Unified Health System (*Sistema* Único *de Saúde*, SUS), ethical and legal principles of the profession, and the institution where it will be used, with the responsibility for compliance lying with the professional[6,8-9]. Such characteristics align with nursing care that has appropriate theoretical support and standardization, promoting efficient, prudent professional practice that is free from harm to patients and legal and ethical issues for professionals[9].

The study was guided by the following research question: How to support the nursing team in the glycemic monitoring of hospitalized individuals with T2DM? The research objective was established as follows: To develop and evaluate a nursing care protocol for glycemic monitoring of individuals with Type 2 Diabetes Mellitus who are hospitalized at a university hospital in the city of Manaus, state of Amazonas.

METHOD

This is a methodological research study that resulted in the construction of a nursing protocol for glycemic monitoring of hospitalized individuals with T2DM. Methodological research is considered a research strategy that aims to propose a new intervention, instrument, device, or measurement method[10]. The study was conducted from March 2021 to June 2022.

The study was conducted at a university hospital located in the city of Manaus, in the state of Amazonas, Brazil. It is a medium-sized hospital that provides services for elective surgeries and various clinical and surgical specialties. It provides full healthcare coverage under the Unified Health System (SUS).

Participants were selected based on convenience, with inclusion criteria including having experience in providing care to hospitalized individuals with T2DM and having worked in the institution for a minimum of two years in the following departments: Medical Clinic, Surgical Clinic, Intensive Care Unit, or Outpatient Clinic. As an exclusion criterion, it was established that professionals consulted by the researchers for clarification of doubts would not participate as evaluators. Seven nurses who met the inclusion and exclusion criteria were identified, and all of them agreed to participate in the study.

Development of the Protocol.

To develop the protocol, the following phases were undertaken: 1) Theoretical phase: elaboration of an Integrative Literature Review (ILR) and search for consensus in scientific societies. 2) Protocol development phase. 3) Evaluation phase by nurses from the institution for which the protocol was developed.

1) Theoretical phase

Conducting an integrative literature review (ILR) on the topic with the objective of analyzing the available evidence regarding nursing care provided to hospitalized individuals with T2DM, specifically focusing on glycemic monitoring. A search protocol was developed following a proposed six-step approach[11] and guided by the research question, using the PICo strategy as a reference: "What nursing care is utilized for glycemic monitoring/assessment of hospitalized individuals with T2DM?" where: P: Population (individuals with T2DM); I: Interest (glycemic monitoring/assessment); Co: Context (hospitals). Based on this question, the following descriptors were defined: nursing; glycemic assessment; hospitalized individual; diabetes mellitus.

Studies from the last five years, from March 2017 to March 2022, in the English, Portuguese, and Spanish languages were included. Duplicate studies and studies that did not align with the scope and population of this protocol were excluded. The following databases were consulted: Scopus, *Literatura Latino-Americana e do Caribe em Ciências da Saúde* (LILACS), PubMed, and *Base de Dados de Enfermagem* (BDENF).

The evaluation of the studies included in the integrative literature review (ILR) was conducted by two researchers, who, in the event of disagreement or doubt, discussed until a consensus was reached. For the synthesis of findings, a table was prepared with the relevant information, selecting the evidence that could contribute to the development of the protocol.

After completing the ILR stage, it was determined that there was a need to complement the information by searching for consensus statements, standards, or protocols in major

scientific societies related to T2DM. In this regard, we sought guidance from the ADA[1], SBD[2], the American Association of Clinical Endocrinology (AACE)[12], as well as consensus or recommendations established in countries such as Australia, Israel, and Croatia, which had well-established standards for glycemic monitoring.

Subsequently, the selection of relevant content for the protocol development was carried out, including what was highlighted in the studies and consensus statements.

2) Protocol development phase

The protocol development was carried out by two researchers, based on the results of the ILR and the consultation of consensus statements, as well as the researchers' experience on the topic and the primary researcher's eight-year tenure at the institution, which helped define the best structure for protocol development.

3) Protocol evaluation phase

The initial version of the protocol was subjected to a preliminary evaluation by nurses working at the study hospital via the *Google Forms* platform.

An evaluation instrument was developed, encompassing the protocol items, in order to gather feedback from the nurses regarding the clarity and relevance of each protocol item. Regarding clarity, a *Likert* scale was presented, requesting that they select one of the four alternatives (1. I totally disagree; 2 I partially disagree; 3 I partially agree; 4. Strongly agree) in relation to each of the items that make up the protocol and requesting that they provide comments. As for relevance, an evaluation was also requested using a *Likert* scale with four alternatives (1. Not relevant; 2. Requires significant revision; 3. Requires minor revision; 4. Relevant), and they were asked to provide comments as well. At the end, they were asked to assess the protocol regarding its applicability, indicating whether it was applicable; applicable with some modifications; applicable with many modifications; or not applicable.

The results obtained regarding clarity and relevance were analyzed by calculating the Content Validity Index (CVI), where the score was calculated by summing the agreement for items rated as "three" or "four," and then dividing by the total number of responses to the items. The evaluation criterion adopted was obtaining a CVI greater than 0.80[13], and if any result of this evaluation yielded an index below 80%, it should be reformulated. Regarding applicability, it was established that it should be applicable or applicable with some modifications by at least 80% of the participants.

Following this preliminary evaluation of the protocol, conducted by nurses, it was submitted to the institution's protocol development and evaluation committee for further analysis, adjustment, and incorporation into the institution's protocols.

The study adhered to ethical principles regarding research involving human subjects and was approved by the Research Ethics Committee with Human Subjects at the Amazonas State University, with approval number 4,404,739.

RESULTS

The construction of the protocol followed the defined phases in the method, which served as the foundation for its development. The ILR, a component of the Theoretical phase, is presented in a more concise manner. A total of 580 articles were found, of which 15

studies were included, as demonstrated in the flowchart of the selection process presented in Figure 1.

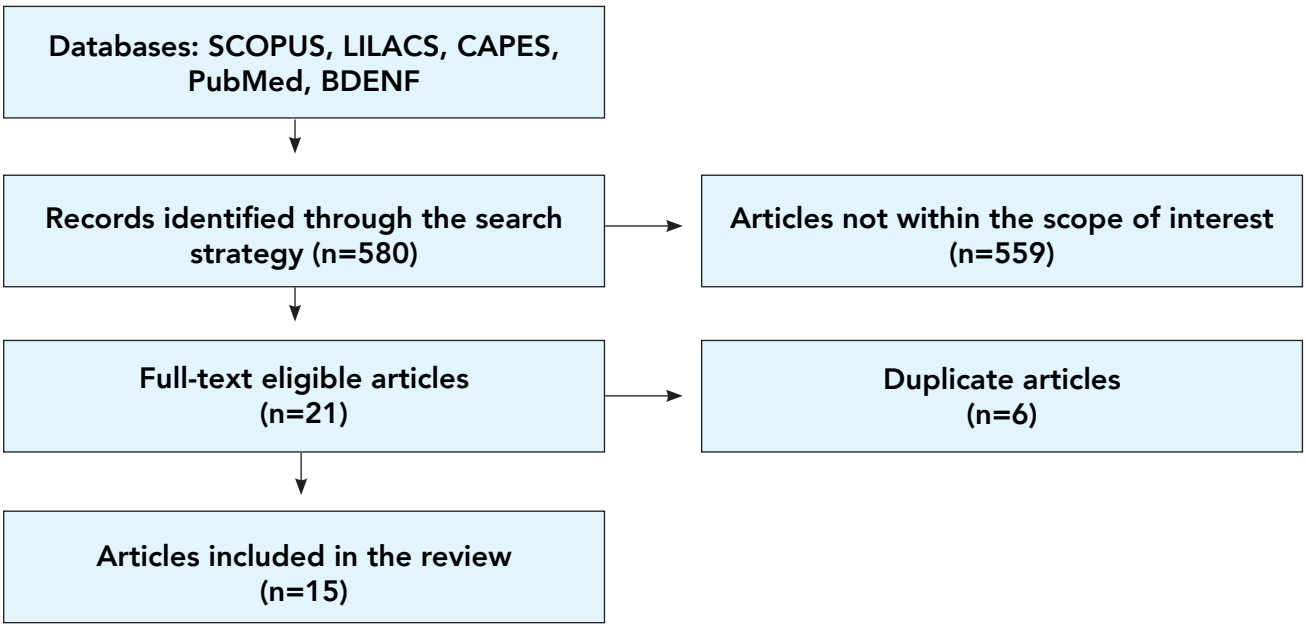

Figure 1 - Flowchart of the integrative review adapted from PRISMA[14]. Manaus, AM, Brazil, 2022
Source: The authors (2022).

Among the selected articles, ten provided significant contributions, addressing the following themes: nursing care for individuals with DM and hypertension[15]; nursing care for individuals with DM experiencing hypoglycemia[16]; care in glycemic control[17-18]; nursing diagnoses[19-20]; hypoglycemia and hyperglycemia among hospitalized individuals[16]; risk of hypoglycemia[19,21]; capillary blood glucose and insulin administration[22]; nursing care in glycemic management[15,23]; stress and glycemic control[24].

Regarding the consensus, these had a significant contribution and were taken as a reference, especially in the decision-making process concerning differing indications found in the ILR. The Standards[1-3,25-26] compile current information and are considered the reference in any practice of care for individuals with DM. Considering that all of them were developed by medical societies, often, there was a need to interpret what was established in these documents, seeking to define their implications for nursing practice.

Regarding the Construction Phase of the protocol, the final decision on the protocol's structure followed the logic of the glycemic monitoring process, consisting of 11 items, which are succinctly described in Chart 1.

Chart 1 - Composition of the Nursing Protocol for Glycemic Monitoring of Hospitalized Individuals with Type 2 Diabetes. Manaus, AM, Brazil, 2022

Protocol Items	Description
1. Introduction	Presents the theme and the protocol, emphasizing the crucial role that nursing plays in this monitoring and the implications of glycemic changes on the health of hospitalized individuals with T2DM

2. Objective	The following was stablished: Supporting the nursing team in glycemic monitoring of individuals with T2DM admitted to the study hospital.
3. Risk factors	Twelve risk factors for glycemic alterations are highlighted, upon which nursing can intervene to modify them, and special attention should be given to their early detection.
4. Glycemic goals	It aims to guide nursing on acceptable blood glucose ranges, as well as levels of hypoglycemia and values considered as hyperglycemia.
5. Signs and symptoms of hyperglycemia and hypoglycemia	The main manifestations indicative of hypoglycemia are listed, organized into two subsections: Signs and symptoms of adrenaline activation (neurogenic or autonomic) and signs and symptoms of neuroglycopenia. For hyperglycemia, signs and symptoms of hyperglycemia and hyperosmolar hyperglycemic state are indicated.
6. Technical procedures for blood glucose measurement	It presents the main points for capillary blood glucose practice and other measurement methods. A Standard Operating Procedure (SOP) has been developed, accompanying the protocol (appendix) on the Capillary Blood Glucose Measurement Technique.
7. Nursing interventions based on blood glucose results	These are related to nursing interventions for each case, separately presenting the measures for hypoglycemia and hyperglycemia, including a table with three columns: care to be performed, considerations about these care measures, and the nursing professional responsible for their execution.
8. General nursing care for glycemic monitoring	The care measures have been organized into a table with four subsections: 1. Actions to prevent glycemic alterations; 2. 3. Blood glucose assessment actions; 4. 4. Blood glucose control actions; 4. Educational actions. Each subsection consists of care measures to be performed, considerations about these care measures, and the nursing professional responsible for their execution.
9. Nursing process related to glycemic monitoring	A care systematization proposal was presented, organized as proposed by Cofen (2009): Nursing History, Nursing Diagnosis, Nursing Planning, Nursing Implementation, and Nursing Evaluation. Relevant aspects for glycemic monitoring were highlighted in each stage of the process.
10. New technologies for glycemic monitoring	Two new technologies, already available in the Brazilian market, have been included: *Continuous real-time glucose monitoring, Flash Glucose Monitoring System*, with the intention of promoting the recognition of these technologies, in the hope that they will be incorporated into the routine of the study hospital.
11. Flowchart	It provides an overview of the activities to be carried out for glycemic monitoring, indicating the decision points for the nurse in glycemic monitoring.

Source: The authors (2022).

Even though it is aimed at a clinical situation of hospitalized individuals with T2DM, the protocol was developed following the person-centered care approach, aiming to promote their inclusion and that of their families in care, helping them understand their health situation and how to cope with aspects such as stress management. Figure 2 displays the cover of the protocol and a QR Code for access to the complete document.

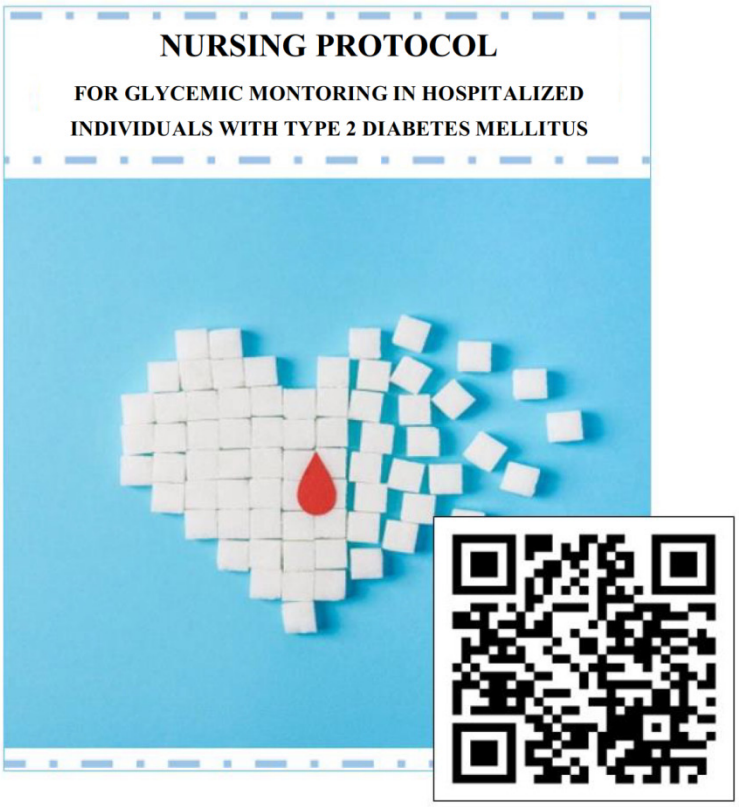

Figure 2 - Protocol cover and QR code for access to the full document. Manaus, AM, Brazil, 2022

Source: The authors (2022).

The Evaluation Phase of the protocol was carried out by seven nurses working in the institution, including two males and five females. Two of them were from the Medical Clinic, one from the Surgical Clinic, three from the Intensive Care Unit, and one from the Outpatient Clinic. All of them had more than five years of experience in the institution.

All the analyses were favorable to the presented Protocol, achieving an CVI of 1.0 in all items, with only three items being assessed as partially clear. Regarding the relevance of the items, all of them were considered relevant, with only the items "New technologies for glycemic monitoring" and "Flowchart" receiving the indication of being partially relevant. The suggested adjustments were minor details and were incorporated into the final version of the Protocol. Regarding applicability, five nurses considered it applicable, and two indicated that it is applicable with some modifications, although they did not specify what modifications would be necessary. The results of this assessment are presented in Chart 2, which displays the Committee's Agreement Rate and the Content Validity Index regarding Clarity and Relevance.

Chart 2 - Committee Agreement Rate and Content Validity Index resulting from the judgment of the evaluators (n=7) on the items that make up the Glycemic Monitoring Protocol regarding **Clarity and Relevance**. Manaus, AM, Brazil, 2022

Evaluation items and subitems	CVI* Clarity	CVI* Relevance

1. Introduction	1.0	1.0
2. Objectives	1.0	1.0
3. Risk Factors for Glycemic Alterations	1.0	1.0
4. Glycemic goals	1.0	1.0
5. Signs and symptoms of hyperglycemia and hypoglycemia	1.0	1.0
6. Technical procedures for blood glucose measurement	1.0	1.0
7. Nursing interventions based on blood glucose results	1.0	1.0
8. General nursing care for glycemic monitoring	1.0	1.0
9. Nursing process related to glycemic monitoring	1.0	1.0
10. New technologies for glycemic monitoring	1.0	1.0
11. Flowchart	1.0	1.0

Source: The authors (2022).

*CVI: Content Validity Index.

DISCUSSION

The Coordination for the Improvement of Higher Education Personnel (*Coordenação de Aperfeiçoamento de Pessoal de Nivel Superior*, CAPES) belonging to the Ministry of Education[27] has established protocols as technological products, defining them as "A set of information, decisions, norms, and rules that apply to a specific activity, encompassing the basic knowledge of a science, technique, trade, or procedure"[27:54]. It was with this perspective that the Nursing protocol for glycemic monitoring of hospitalized individuals with T2DM was developed. Scientific evidence served as the foundation for the protocol and followed basic rules for search and analysis, aiming to provide a product that can be used not only in the hospital for which it was developed but also as a reference for nursing practice in glycemic monitoring of hospitalized individuals in different healthcare institutions.

The items that make up the developed Protocol contain important details, encompassing essential elements for effective glycemic monitoring, expressing a synthesis not only of the integrative review conducted but also of what consensus and recommendations from important scientific societies indicate.

Glycemic monitoring is emphasized in various studies and consensus statements as of great importance. If not conducted and assessed correctly, following established principles, it can lead to severe complications and even death[18,25,27].

The relevance of applying glycemic control protocols is related to the reduction in the progression of the condition towards hyperglycemia[20]. Furthermore, this control allows for the maintenance of optimal glucose levels and prevents significant fluctuations through frequent blood glucose monitoring with immediate intervention in the presence of serum glucose imbalances[28].

Among hospitalized individuals, episodes of hyperglycemia, hypoglycemia, and glucose variability are associated with adverse outcomes, including mortality, highlighting the need for continuous monitoring and careful management of hospitalized individuals[1]. The development of a glycemic monitoring protocol offers significant contributions as it can prevent these severe situations associated with high mortality[23].

Hospitalized individuals are more susceptible to stress, which contributes to the

development of hyperglycemia[24]. It was in this sense that the Protocol included content beyond purely technical aspects, presenting nursing actions that help, for example, monitor stress and develop strategies for its control.

A study on the effectiveness of nursing protocols aimed at patients with diabetic complications highlights the importance of developing glycemic control protocols to improve the management of complications resulting from hospitalization[29]. In the same vein, other authors advocate for the importance of using glycemic control protocols, emphasizing hypoglycemia as a significant risk to which these individuals are exposed[4,6].

The topic of glycemic monitoring, although always referred to as important in various texts, is not always presented in detail. There is a recommendation for more frequent controls and continuous nursing attention, as they are responsible for measuring and monitoring blood glucose, as well as performing appropriate interventions[20,25]. Evidence supports that the use of a standardized glycemic protocol improves glycemic control, reduces healthcare costs, and shortens hospitalization time[20,30]. Prolonged hospitalization time is indicative of an unstable blood glucose level, and it is relevant to include as a risk factor associated with the nursing diagnosis: risk for unstable blood glucose[28].

The autonomy that nurses have in glycemic monitoring should be considered as a significant responsibility in the provision of safe and appropriate care. This includes not only the clinical aspects involved in this control but also the importance of using these moments as opportunities for learning for hospitalized individuals with T2DM and for reducing the stress associated with hospitalization and the challenges of managing T2DM[25].

It is relevant to highlight that nursing professionals are accountable for their actions, and the presence of a protocol does not interrupt the issue of professional autonomy. With clear reasons and based on scientific evidence, a professional can choose not to follow the protocol, and likewise, when following the protocol, they maintain responsibility for their actions, but with the support of the institution[9].

Even though the developed protocol is specific to nursing, it interfaces with other professions and should be implemented after extensive discussion with professionals who perform their activities in the institution, promoting a collaborative approach among members of the healthcare team, with the goal of optimizing health outcomes and health-related quality of life. Furthermore, the intention is for each bedside activity to be understood as an opportunity for health education, promoting new learning for hospitalized individuals and their families/caregivers. Additionally, demonstrating interest and being attentive to small emotional changes can assist in better glycemic control.

FINAL CONSIDERATIONS

The Protocol for glycemic monitoring of hospitalized individuals with T2DM was developed in a manner that meets scientific criteria and provides nursing with an important reference for what should be considered in glycemic monitoring. The limitations in the literature on this topic, especially in Brazilian journals, give greater relevance to the developed protocol, which can be used by other institutions with adjustments relevant to each specific context.

The protocol's implementation should encompass a training program for the hospital nursing staff, and its effectiveness can be assessed in a specific study that examines glycemic control in hospitalized individuals with type 2 diabetes before and after its implementation.

The research is relevant as it enables comprehensive, patient-centered care, promotes autonomy, and aids in the rehabilitation process. Additionally, it encourages reflection on the standardization and individualization of nursing care for diabetic amputees, fostering the development of scientifically validated tools to enhance nursing professionals' assistance.

As a limitation of the study, we highlight the limited participation of nurses from the institution in the protocol development, which will be overcome later by the proposal to have it reviewed by the institution's committee responsible for protocol development and evaluation.

REFERENCES

1. American Diabetes Association. Classification and diagnosis of diabetes: standards of medical care in diabetes-2019. Diabetes Care. [Internet]. 2019 [cited 2022 Mar 25]; 42(Suppl 1):13–28. Available from: http://dx.doi.org/10.2337/dc19-S002

2. Sociedade Brasileira de Diabetes. Diretriz da Sociedade Brasileira de Diabetes 2023 Update1 [Internet]. 2023 [cited 2023 Sept 13]. Available from: https://diretriz.diabetes.org.br/

3. American Diabetes Association Professional Practice Committee. Diabetes care in the hospital: standards of medical care in diabetes-2022. Diabetes Care [Internet]. 2022 [cited 2022 Mar 25]; 45(Suppl 1):S244–53. Available from: http://dx.doi.org/10.2337/dc22-S016

4. Quel RM, Alóchio KV, Sá SCP. Hipoglicemia e seus fatores de risco na infusão contínua de insulina em pacientes críticos. Rev Cubana Enferm. [Internet]. 2019 [cited 2022 Apr 14]; 35(3). Available from: http://www.revenfermeria.sld.cu/index.php/enf/article/view/2174

5. Bagweneza V, Musabirema P, Mwiseneza MJ, Collins A, Bhengu BR. Diabetes health education: nurses' knowledge of essential components at a Rwandan hospital. Rwanda J Med Health Sci. [Internet]. 2019 [cited 2022 Mar 25]; 2(2):172. Available from: http://dx.doi.org/10.4314/rjmhs.v2i2.13

6. Conselho Federal de Enfermagem (COFEN). Diretrizes para elaboração de protocolos de enfermagem na atenção primária à saúde pelos conselhos regionais [Internet]. Brasília: COFEN, 2018 [cited 2022 Mar 28]. Available from: http://www.cofen.gov.br/wp-content/uploads/2019/03/Diretrizes-para-elabora%C3%A7%C3%A3o-de-protocolos-de-Enfermagem-.pdf

7. Figueiredo TWB, Mercês NNA das, Lacerda MR, Hermann AP. Construção de um protocolo de cuidados de enfermagem: relato de experiência. Rev bras enferm. [Internet]. 2018 [cited 2022 Mar 28]; 71(Suppl 6):2837-42. Available from: http://dx.doi.org/10.1590/0034-7167-2017-0846

8. Costa ANB, Almeida ECB, Melo TS. Elaboração de protocolos assistenciais à saúde como estratégia para promover a segurança do paciente. Rev Bras Educ Saúde. [Internet]. 2018 [cited 2022 Mar 28]; 8(1):25. Available from: http://dx.doi.org/10.18378/rebes.v8i1.5479

9. Pimenta CA de M, Pastana ICAS, Sichieri SMK, Solha RKT, Souza W. Guia para construção de protocolos assistenciais de enfermagem [Internet]. São Paulo: COREN; 2015 [cited 2022 Mar 28]. Available from: http://biblioteca.cofen.gov.br/wp-content/uploads/2016/06/Guia-para-Constru%C3%A7%C3%A3o-de-Protocolos-Assistenciais-de-Enfermagem.pdf

10. Mantovani MF, Sarquis LM, Kalinke LP, Kuznier TP, Pizzolato AC, Mattei AT. Pesquisa metodológica: da teoria à prática. In: Lacerda MR, Ribeiro RP, Costenaro RGS. Metodologias da pesquisa para a enfermagem e saúde: da teoria à prática. Moriá, Porto Alegre; 2018.

11. Mendes KDS, Silveira RC de CP, Galvão CM. Revisão integrativa: método de pesquisa para a incorporação de evidências na saúde e na enfermagem. Texto contexto enferm. [Internet] 2008 [cited 2022 Mar 28]; 17(4):758-64 2. Available from: https://doi.org/10.1590/S0104-07072008000400018

12. American Association of Clinical Endocrinology (AACE). Comprehensive type 2 diabetes management algorithm [Internet]. 2020 [cited 2022 Mar 10]; Available from: https://pro.aace.com/pdfs/diabetes/AACE_2019_Diabetes_Algorithm_03.2021.pdf

13. Pasquali L. Psicometria: teoria dos testes na psicologia e na educação. Petrópolis: Vozes; 2017.

14. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, *et al*. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. Syst Rev. [Internet]. 2021 [cited 2022 Mar 10]; 10(1):89. Available from: http://dx.doi.org/10.1186/s13643-021-01626-4

15. Vieira VA de S, Azevedo C, Sampaio F de C, Oliveira PP de, Moraes JT, Mata LRF da. Cuidados de enfermagem para pessoas com diabetes mellitus e hipertensão arterial: mapeamento cruzado. Rev Baiana Enfermagem. [Internet]. 2017 [cited 2022 Mar 18]; 31(4). Available from: http://dx.doi.org/10.18471/rbe.v31i4.21498

16. Kyi M, Colman PG, Rowan LM, Marley KA, Wraight PR, Fourlanos S. Glucometric benchmarking in an Australian hospital enabled by networked glucose meter technology. Med J Aust. [Internet]. 2019 [cited 2022 Mar 18]; 211(4):175–80. Available from: http://dx.doi.org/10.5694/mja2.50247

17. Jeon SY, Shi Y, Lee AK, Hunt L, Lipska K, Boscardin J, *et al*. Fingerstick glucose monitoring in veterans affairs nursing home residents with diabetes mellitus. J Am Geriatr Soc. [Internet]. 2021 [cited 2022 Mar 18]; 69(2):424–31. Available from: http://dx.doi.org/10.1111/jgs.16880

18. Donovan P, Eccles-Smith J, Hinton N, Cutmore C, Porter K, Abel J, *et al*. The Queensland Inpatient Diabetes Survey (QuIDS) 2019: the bedside audit of practice. Med J Aust. [Internet]. 2021 [cited 2022 Mar 28]; 215(3):119–24. Available from: http://dx.doi.org/10.5694/mja2.51048

19. Algarra AJC, Beltrán KM, Castro DMB, Zambrano SMH, Carrillo DCH. Cuidados de enfermería para la persona adulta, diabética con hipoglucemia: revisión integrativa. Rev Repert Med Cir. [Internet]. 2021 [cited 2022 Mar 02]; 59–73. Available from: http://dx.doi.org/10.31260/repertmedcir.01217372.1001

20. Brinati LM, Januário CF de, Balbino PC, Macieira TGR, Cardoso SA, Moreira TR, *et al*. Incidence and prediction of unstable blood glucose level among critically ill patients: a cohort study. Int J Nurs Knowl. [Internet]. 2021 [cited 2022 Mar 02]; 32(2):96–102. Available from: http://dx.doi.org/10.1111/2047-3095.12299

21. Shah BR, Walji S, Kiss A, James JE, Lowe JM. Derivation and validation of a risk-prediction tool for hypoglycemia in hospitalized adults with diabetes: the hypoglycemia during hospitalization (HyDHo) score. Can J Diabetes. [Internet]. 2019 [cited 2022 Mar 02]; 43(4):278-82. Available from: http://dx.doi.org/10.1016/j.jcjd.2018.08.061

22. Kaisen AR, Parkosewich JA, Bonito KA. Factors associated with timely blood glucose testing and insulin administration in patients receiving mealtime insulin coverage in medical surgical units. Diabetes Educ. [Internet]. 2018 [cited 2022 Mar 02]; 44(2):188–200. Available from: http://dx.doi.org/10.1177/0145721718760514

23. Pearson SM, Whittam B, Kulavarasalingam K, Mitchell-Gears A, James C, Ajjan RA. Reduction in cardiovascular mortality following severe hypoglycemia in individuals with type 2 diabetes: the role of a pragmatic and structured intervention- Structured intervention for community hypoglycemia. Cardiovasc Diabetol. [Internet]. 2021 [cited 2022 Mar 28]; 20(1):18. Available from: http://dx.doi.org/10.1186/s12933-020-01204-3

24. Li D, Elliott T, Klein G, Ur E, Tang TS. Diabetes nurse case management in a Canadian tertiary care setting: results of a randomized controlled trial. Can J Diabetes. [Internet]. 2017 [cited 2022 May 28]; 41(3):297–304. Available from: http://dx.doi.org/10.1016/j.jcjd.2016.10.012

25. Savion I, Khoury K, Alkoken G, IRaz I, Leibovitz G, Eldor R, *et al*. Glucose management by registered nurses for adult patients hospitalized in medical wards: structured guidelines (protocol) and working process. Diabetes spectrum. [Internet] 2010 [cited 2022 May 28]; 23(4):268–71. Available from: https://doi.org/10.2337/diaspect.23.4.268

26. Krleza JL, Dorotic A, Grzunov A, Maradin M. Capillary blood sampling: national recommendations on behalf of the Croatian Society of Medical Biochemistry and Laboratory Medicine. Biochemia Medica. [Internet]. 2015 [cited 2022 July 02]; 25(3):335–58. Available from: http://dx.doi.org/10.11613/BM.2015.034

27. Ministério da Educação (BR). Coordenação de Aperfeiçoamento de Pessoal de Nível Superior CAPES.

Diretoria de Avaliação. Considerações sobre Classificação de Produção Técnica e Tecnológica (PTT) Enfermagem [Internet]. 2020 [cited 2022 June 20]. Available from: https://www.gov.br/capes/pt-br/centrais-de-conteudo/documentos/avaliacao/ENF_ConsideraessobreClassificaodeProduoTcnicaeTecnolgica.pdf

28. Marelli G, Avanzini F, Iacuitti G, Planca E, Frigerio I, Busi G, *et al*. Effectiveness of a nurse-managed protocol to prevent hypoglycemia in hospitalized patients with diabetes. J Diabetes Res. [Internet]. 2015 [cited 2022 Mar 28]; 2015:173956. Available from: http://dx.doi.org/10.1155/2015/173956

29. Pamungkas RA, Chamroonsawasdi K. Psychological problems related to capillary blood glucose testing and insulin injection among diabetes patients. Front Nurs. [Internet]. 2020 [cited 2022 Apr. 28]; 7(2):87–95. Available from: http://dx.doi.org/10.2478/fon-2020-0015

30. Lima NKG de, Fernandes MRCC, Silva JC da, Silva AFR, Coura AS, França ISX de. Effectiveness of patient-directed nursing protocols with diabetic complications. Rev Pesqui Cuid é Fundam Online. [Internet]. 2021 [cited 2022 Mar 28]; 13:685–91. Available from: http://dx.doi.org/10.9789/2175-5361.rpcfo.v13.9449

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Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work - **Frota GA, Silva DMGV da, Ferreira DS.** Drafting the work or revising it critically for important intellectual content - **Frota GA, Silva DMGV da, Arruda C, Ribeiro M de N de S, Boell JEW, Ramos FRS.** Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved - **Frota GA, Silva DMGV da**. All authors approved the final version of the text.

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