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REVIEW PROTOCOL

Nursing performance in the application of intravenous insulin therapy: scoping review protocol

Atuação da enfermagem na aplicação de insulinoterapia intravenosa: protocolo de revisão de escopo

Actuación de enfermería em la aplicación de la terapia com insulina intravenosa: protocolo de revisión del alcance

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ABSTRACT

Objective: To map the nursing care described in scientific publications for the application of intravenous insulin therapy in critically ill patients. **Inclusion criteria**: Studies presenting nursing care in the application of intravenous insulin therapy in intensive care units in all areas such as cardiology, neurology and surgery, with no restrictions on the time frame or methodological design. **Method:** Scoping review (Open Science Framework registry: https://osf.io/y7bmw), conducted using the Joanna Briggs Institute methodology and the PRISMA-ScR checklist, to identify documents from the following sources: LILACS; PubMed; Embase, Scopus and CINAHL. And also studies of gray literature obtained from the Brazilian Digital Library of Theses and Dissertations. The studies will be presented in narrative form for analysis and synthesis guided by the moments of nursing intervention during intravenous insulin therapy.

DESCRIPTORS: Insulin; Intensive Care Units; Intravenous Infusions; Nursing Care.

RESUMO

Objetivo: Mapear os cuidados de enfermagem descritos nas produções científicas para a aplicação de insulinoterapia intravenosa em pacientes críticos. **Critérios de inclusão:** Estudos que apresentem os cuidados realizados pela enfermagem, na aplicação de insulinoterapia intravenosa em unidades de terapia intensiva em todas as áreas como cardiológicas, neurológicas e cirúrgicas, sem restrições quanto ao recorte temporal e delineamento metodológico. **Método:** Revisão de escopo (registro *Open Science Framework*: https://osf.io/y7bmw), conduzido pela metodologia do *Joanna*

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Briggs Institute e checklist PRISMA-ScR, para identificação dos documentos nas fontes: LILACS; *PubMed*; *Embase, Scopus e* CINAHL, e estudos de literatura cinzenta obtidos na Biblioteca Digital Brasileira de Teses e Dissertações. Os estudos serão apresentados de modo narrativo para análise e síntese guiada pelos momentos de intervenção de enfermagem durante a insulinoterapia intravenosa.

DESCRITORES: Insulina; Unidades de Terapia Intensiva; Infusões Intravenosas; Cuidados de Enfermagem.

RESUMEN

Objetivo: Mapear los cuidados de enfermería descritos en publicaciones científicas para la aplicación de la insulinoterapia intravenosa en pacientes críticos. **Criterios de inclusión:** Estudios que presenten los cuidados de enfermería en la aplicación de la insulinoterapia intravenosa en unidades de cuidados intensivos en todas las áreas como cardiología, neurología y cirugía, sin restricciones de marco temporal ni de diseño metodológico. **Método:** Revisión de alcance (Open Science Framework registry: https://osf.io/y7bmw), realizada utilizando la metodología del Instituto Joanna Briggs y la lista de verificación PRISMA-ScR, para identificar documentos en las siguientes fuentes: LILACS; PubMed; Embase, Scopus y CINAHL. Y también estudios de literatura gris obtenidos de la Biblioteca Digital Brasileña de Tesis y Disertaciones. Los estudios serán presentados en forma narrativa para análisis y síntesis orientados por los momentos de intervención de enfermería durante la insulinoterapia intravenosa.

DESCRIPTORES: Insulina; Unidades de Cuidados Intensivos; Infusiones Intravenosas; Cuidados de Enfermería.

INTRODUCTION

Increased blood glucose in the presence of some acute disease, such as severe diseases, surgery, trauma, shocks use of drugs or enteral and parenteral nutrition is characterized by stress hyperglycemia (HS). Some factors are contributing to its occurrence, by inhibiting the release of insulin, such as exogenous glycocorticoids, catecholamines, and the release of inflammatory mediators in acute situations [1].

Several mechanisms have been proposed to explain how hyperglycemia can cause damage. Among them, the susceptibility to septic states in critical patients, resulting from the increase in susceptibility to infections; hydroelectrolytic disorders due to osmotic imbalance; exacerbation of the inflammatory and the thrombotic phenomena, secondary to the generation of inflammatory cytokines [2].

In recent years, observational studies have shown that hyperglycemia, regardless of its cause, is a significant negative predictor for intra-hospital mortality, for the occurrence of neurological events, postoperative infections and increased length of hospitalization in the intensive care unit (ICU), compared to normoglycemic patients. In addition, patients with HS without a history of diabetes mellitus (DM) have a worse prognosis and a higher predisposition to develop this disease [3].

In intensive care units, intravenous insulin is commonly used to control plasma glucose levels as the first choice in critical patients in acute situations. In the preparation of the infused solution, rapid-acting (regular) human insulin is the only recommended for intravenous application. Knowing that its half-life,

when administered by this route, is less than 15 minutes, one of the practices used is continuous infusion that allows the dynamic adjustment of its dose according to the patient's response. This characteristic is fundamental for the critical patient, since his clinical condition is susceptible to sudden changes in evolution [1,3].

Since 2001, glycemic control in critical patients using intravenous insulin therapy has been extensively studied to define an ideal glycemic target. In this scenario, studies have compared the protocols of insulin therapy and demonstrated their benefits in critical patients. A classic study compared insulin therapy between intensive control (maintenance of blood glucose between 80 and 110 mg/dl) and conventional treatment (maintenance at a level between 180-200 mg/dl), in adults hospitalized in the surgical UTI, and observed a decrease in morbidity and mortality, related to a 41% reduction in cases of renal insufficiency (RI), 50% of hemotransfusions and 34% of mortality in the group that received intensive insulin therapy [4].

In a sample of patients after cardiac surgery, it was observed that there was a significant decrease in the rates of sepsis, mortality, blood transfusion and dialysis need in the glycemic control group maintained intensively between 80-110 mg/dl. This study called Leuven I followed the study entitled Leuven II in 2006, in which the results were divergent. However, the length of hospital stay, the use of mechanical ventilation and the need for dialysis were lower with intensive intravenous insulin use [5].

In Brazil, the study compared, in the first 72 hours, the use of intensive insulin protocol, whose glycemic levels should be maintained between 80-110 mg/dl, and the conventional one, in which glycemic levels should remain between 180-220 mg/dl in patients with severe sepsis and septic shock. Although there was no significant difference between the groups in mortality, hemodynamic instability was higher in the conventional group [6].

In all protocols, even with different glycemic targets, it is emphasized that insulin is considered one of the drugs that most cause adverse events in hospitalized patients, and errors in its dosage and/or administration occur relatively frequently [7].

Given this risk, it is known that, although the prescription of intravenous insulin (IV) is a medical responsibility, the professional responsible for its preparation, administration and monitoring of its effects is the nurse, together with the nursing team. Therefore, the team should have maximum knowledge about all aspects and stages of this drug therapy, to prevent complications to the patient and offer quality nursing care [8].

Given the evidence in the literature that indicates hyperglycemia as a negative predictor for hospitalized patients, it is essential to manage insulin therapy assertively for safe and effective care, that is, to achieve the glycemic goal without causing harm to the patient. However, the studies hardly discuss nursing assistance in the management of this therapy, although it is the professional category that has

essential role in glycemic measurement and adjustment of the infused dose indicated in institutional protocols [4-6].

OBJETIVE

To map the nursing care described in scientific productions for the application of intravenous insulin therapy in critical patients.

METHODOLOGY

Study design

This is a scope review, based on guidelines from the Joanna Briggs Institute (JBI) and the PRISMA-ScR checklist [9]. As proposed by the JBI, a scope review should follow the following steps: Elaboration of the question of the mnemonic-guided research "PCC" (population, concept and context); Construction, registration and availability of the review protocol; Definition of the eligibility criteria and the search strategy for publications in data sources; Definition of the selection criteria for publications; Description of the extraction of data from articles; Analysis of data; Synthesis of results. This review method allows mapping the important concepts that support the researched area of knowledge, summarizing and disseminating research results, identifying knowledge gaps, examining the extent and summarizing the data, so that its reliability is suggestive of improvement in the research area because its quality assessment is not part of the scope mission. This protocol was registered in the Open Science Framework (OSF registries - https://osf.io/y7bmw) and is detailed according to the items of the template for scoping review protocols of the JBI.

Review Question

To elaborate the issue of this review, we adopted a strategy that considers aspects of the population, concept and context of the object to be researched, under the acronym PCC: Population (nursing professionals working in intensivised units), Concept (nursing care required for the application of intravenous insulin therapy) and Context (intensive care unit). Therefore, the review question was elaborated as follows: What are the nursing care necessary for the application of intravenous insulin therapy in the glycemic control of critical patients hospitalized in intensive care units?

Eligibility criteria

The studies that will be part of this review will be considered according to selection criteria aligned with the review question outlined in the PCC strategy, as described in Table 1:

Table 1. Eligibility criteria for studies, according to the PCC strategy used

Population
Studies involving nursing professionals, with higher and secondary education, who work in intensive care units will be included.
Concept
Studies that present or discuss nursing care in the application of intravenous insulin therapy will be included. The concept of intravenous infusions was considered: "Long-term administration (minutes or hours) of a liquid (saline solution/medication) into the vein by venipuncture, allowing the liquid to flow by gravity or by pumping it" [10].
Context
Studies involving intensive care units in all areas such as cardiology, neurological and surgical will be included.
Types of Evidence Sources
Studies written in any language in the form of articles, dissertations and theses will be included. There are no restrictions on the time frame or methodological design..

Source: The authors, 2024.

Search strategy

To identify the studies published on the subject of this review, the following databases were consulted: Latin American and Caribbean Literature in Health Sciences (LILACS); PubMed; Embase, Scopus and Cumulative Index to Nursing and Allied Health Literature (CINAHL). The studies of gray literature that will be considered include those from the Brazilian Digital Library of Theses and Dissertations (BDTD).

The access to data sources was as follows: for LILACS, through the Virtual Health Library (VHL), the others via the CAPES Journal Portal. In addition, for the gray literature, access was the own site of each institutional body. All held on October 9, 2023.

For identification of search terms, the controlled vocabularies of the health area were consulted DeCs (Descriptors in Health Sciences), MeSH (Medical Subject Headings) and EMTREE (Embase Subject Headings). No filters for date, language and/or study design were applied. The process of elaboration of search strategies met the recommendations of the Peer Review of Electronic Search Strategies (PRESS), being carried out by a professional librarian of the research team. The terms related to the acronym PCC were adapted for each data platform, considering the variations of the combination with the Boolean operators AND and OR, in order to obtain the final strategies that can be observed in Table 2.

Table 2. Search strategies according to data sources

Sources	Search Strategies	Articles found
PUBMED	(Insulin[mh] OR Insulin, Regular, Human[mh] OR Insulin[tiab] OR Novolin[tiab] OR Humulin[tiab]) AND (Administration, Intravenous[mh] OR Infusions, Intravenous[mh] OR Intravenous[tiab]) AND (Intensive Care Units[mh] OR Intensive Care[tiab] OR Intensive Therapy[tiab] OR Intensive Treatment[tiab] OR Critical Care[tiab] OR Critical*[tiab] OR ICU[tiab]) AND (Nursing[mh] OR Nursing Care[mh] OR Nurses[mh] OR Nursing[tiab] OR Nurse*[tiab]) NOT (Child*[ti] OR Neonat*[ti] OR Symposium[ti])	N = 100
SCOPUS	TITLE-ABS-KEY(Insulin OR Novolin OR Humulin) AND TITLE-ABS-KEY("Administration, Intravenous" OR "Infusions, Intravenous" OR "Intravenous") AND TITLE-ABS-KEY("Intensive Care" OR "Intensive Therapy" OR "Intensive Treatment" OR "Critical Care" OR Critical* OR ICU) AND TITLE-ABS-KEY(Nursing OR "Nursing Care" OR Nurse*) AND NOT TITLE(Child* OR Neonat*) AND (LIMIT-TO(DOCTYPE,"ar") OR LIMIT-TO(DOCTYPE,"re"))	N = 155
EMBASE	('insulin'/exp OR 'human insulin'/exp OR 'humilin':ti,ab OR 'insulin*':ti,ab OR 'novolin':ti,ab OR 'humulin':ti,ab) AND ('intravenous drug administration'/exp OR 'intravenous':ti,ab) AND ('intensive care unit'/exp OR 'gicu':ti,ab OR 'gicus':ti,ab OR 'icu':ti,ab OR 'critical care':ti,ab OR 'intensive care':ti,ab OR 'intensive therapy':ti,ab OR 'intensive treatment':ti,ab) AND ('nursing'/exp OR 'nursing':ti,ab OR 'nursing care'/exp OR 'nursing care':ti,ab OR 'nurse'/exp OR 'nurse*':ti,ab) AND [embase]/lim NOT ([embase]/lim AND [medline]/lim) AND 'article'/it	N = 12
CINAHL	(Insulin* OR Novolin OR Humulin) AND ("Administration, Intravenous" OR "Infusions, Intravenous" OR Intravenous OR Intraveno*) AND (Intensive Care OR Intensive Therapy OR Intensive Treatment OR Critical Care OR Critical* OR Terapia Intensiva OR Tratamento Intensivo OR Cuidados Críticos OR ICU OR UTI) AND (Nursing OR "Nursing Care" OR Nurse* OR Enferm*)	N = 39
LILACS	(Insulin* OR Novolin OR Humulin) AND ("Administration, Intravenous" OR "Infusions, Intravenous" OR "Intravenous" OR Intraveno*) AND ("Intensive Care" OR "Intensive Therapy" OR "Intensive Treatment" OR "Critical Care" OR Critical* OR "Terapia Intensiva" OR "Tratamento Intensivo" OR "Cuidados Críticos" OR ICU OR UTI) AND (Nursing OR "Nursing Care" OR Nurse* OR Enferm*) AND (db:("LILACS"))	N = 21
BDTD	(Insulin* OR Novolin OR Humulin) AND ("Administration, Intravenous" OR "Infusions, Intravenous" OR Intravenous OR Intraveno*) AND ("Intensive Care" OR "Intensive Therapy" OR "Intensive Treatment" OR "Critical Care" OR Critical* OR "Terapia Intensiva" OR "Tratamento Intensivo" OR "Cuidados Críticos" OR ICU OR UTI) AND (Nursing OR "Nursing Care" OR Nurse* OR Enferm*) https://shre.ink/BDTD-Insulina-Intravenosa	N = 07

Selection of studies in the researched sources

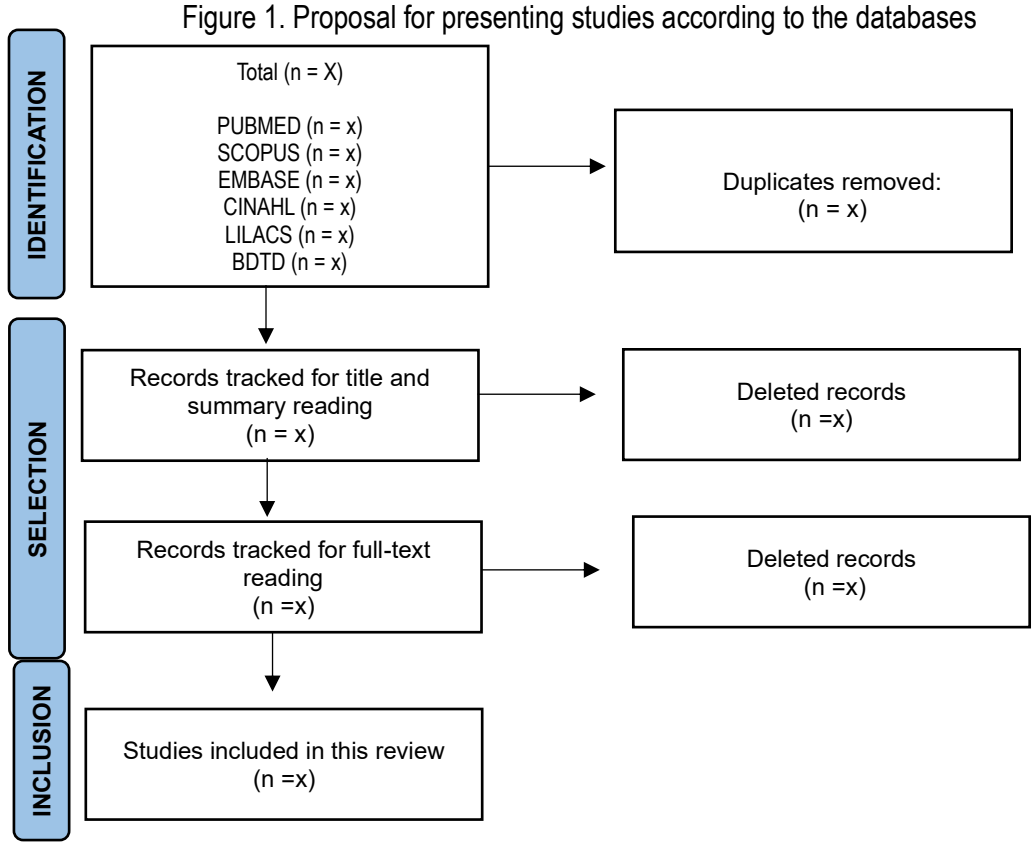
The selection of material on the subject will be carried out initially with the help of the reference management system Rayyan CQRI Systems. By exporting the files containing the literature found in each source of information, two reviewers will independently read the abstracts of the texts and, according to the pre-defined eligibility criteria, the selection of studies will be made ensuring the process blindly,

through the blind on feature that the system provides. The study is currently at this stage, and if there is disagreement between the two reviewers, the impasse will be resolved by a third reviewer.

After performing the selection, the resulting texts will be read in full and analyzed seeking to answer the research question to specify the nursing care necessary for the application of intravenous insulin therapy in the glycemic control of critical patients hospitalized in therapy units intensive.

The results will be organized and presented, showing the source, the quantity of studies identified, the reasons for any exclusions and final quantity of the sample listed for data extraction. Later, the selection development will be presented through a PRISMA flow diagram [11], and its structure can be seen in figure 1.

Figure 1. Proposal for presenting studies according to the databases



Source: Authors, 2023.

Data extraction

For the data extraction in this review, the reference list originated in Rayyan will be exported to a spreadsheet of the Microsoft Excel® program and filled by the reviewers, independently, in accordance with the form specific to this step, to meet the objective and the issue of review. The items to be extracted are shown in table 3. The form for data extraction may be reviewed and modified, if there is a need to include other information not contained in the initial form. The changes, if any, will be detailed later in the scoping review.

Table 3. Information that will be extracted from the studies.

Items for extraction in studies
Identification of studies
Author, year, country where the study was conducted, type of study, objective, design, professional category of the author.
Population
Number of participants and professional category (nurse or nursing technician).
Results found
Nursing care used to apply the intravenous insulin therapy protocol.

Source: Authors themselves, 2024.

Data analysis and presentation

The aim is to present the characteristics of the publications in a descriptive way with calculation of relative and absolute frequencies: total of studies included, type of studies, year of publication, professional category of authorship and population. After the extraction of the object of interest (nursing care), the presentation will be narratively with analysis for presentation of the synthesis guided by the moments of intervention during intravenous insulin therapy, namely:

- Care in the preparation of the solution and beginning of administration;
- Care during administration related to the validity of the solution after preparation, glycemic measurement and adjustment of the infused dose;
- Care after the end of therapy.

Contributions to practice

Insulin is considered a potentially dangerous drug (PDD), which means that it presents greater need for high vigilance, because of the risk of causing significant damage to the patient when failure occurs in the process of its use. Therefore, it requires strict care to ensure the safety of its administration [12].

The present study aims to contribute to the care of critical patients, by highlighting the nursing care essential for glycemic control, improving the quality of practice together with patient safety. To improve the quality of teaching, it intends to contribute by gathering information that deepen the theoretical body of knowledge of nursing about the particularities of intensive care. It is also recognized that the study will serve as an incentive for future research.

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